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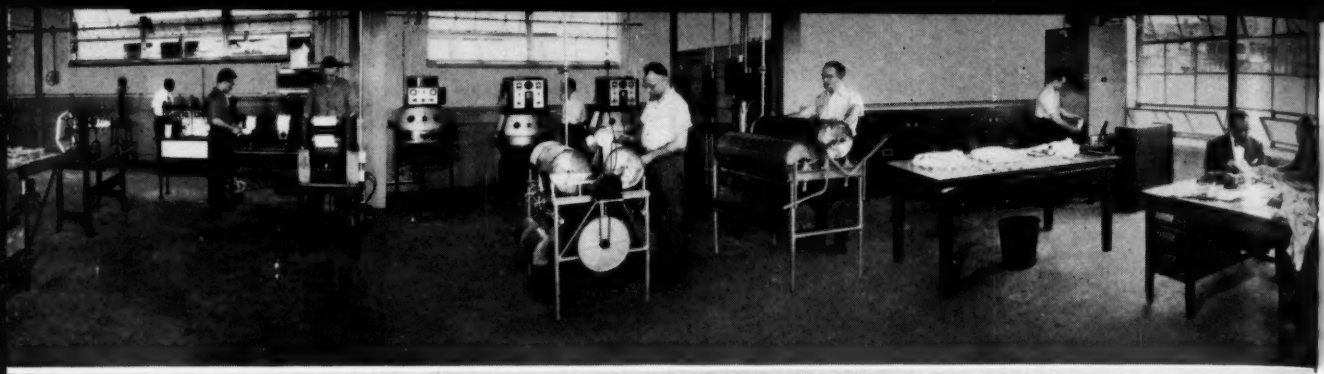

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Proceedings of the
American Association of Textile Chemists and Colorists

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JANUARY 21, 1952

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RAPID CONTROL TEST TO INDICATE COLORFASTNESS TO 105°F WASHING

Tentative Test Method

68-51

Principle of Method

Colored fabrics are quickly screened by this test for bleeding and probable staining of adjacent test fabric in the No 1 Wash Test (36-45). This is done by spotting test specimens with the specified soap solution, covering with a blotter and heating under a flat iron for 5 minutes. The blotter is then examined for transfer of color from the test specimen.

Scope

This method of test is applicable to dyed or printed fabrics.

Apparatus

Glass plate, ca 3" x 6" x ¼" thick.

Flat iron or other heat source, thermostatically controlled.

Pipette, 10 ml.

Materials

White AATCC Textile Blotting Paper, 3" x 3" (*1*).

Test solution, prepared as follows:

Slowly add 12.5 g carboxy methyl cellulose (Hercules CMC—medium viscosity, type 70—or other equivalent brand) to 250 ml hot (near boil) water with constant stirring. Allow the mixture to stand for about 15 minutes. In the meantime, dissolve 2.5 g of neutral soap in 250 ml warm water. Then slowly add this soap solution to the CMC solution with constant stirring. The resulting viscous solution is ready for use.

This test is the first of a series planned by the AATCC Research Committee on Simplified Wet Control Tests to provide rapid screening methods and multi-purpose or "combined" tests. These tests are intended as auxiliary tests to indicate results which may be expected from the longer and more detailed standard tests.

The members of the Committee are as follows:

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A F Tesi, Secretary
C A Baker
P J Fynn
N B Gobeil
E C Hansen
L S Little
A L Polese
R Stutz
I H Welch

G J Mandikos, AATCC Research Associate at Lowell Textile Institute, has been cooperating with the Committee in the development of this test method and other current investigations.

Test Specimens

3" x 3" pieces of fabric.

Procedure

Place a test specimen upon the glass plate and pipet 0.5 ml of the test solution onto the specimen. Cover the spotted specimen with a blotter, and place on it a flat iron heated to 250°F (121°C) (*2*). After 5 minutes separate the "sandwich" and examine the blotter for the degree of color loss from the specimen.

Evaluation

The appearance of color on the blotter indicates that the color would bleed into solution and probably stain adjacent uncolored test fabric in the No 1 Wash Test. For positive determination of staining properties the No 1 Wash Test should also be made.

Notes

(*1*). White AATCC Textile Blotting Paper is obtainable from Standard Paper Mfg Co, Richmond, Va, attn: J S Walden, Sales Dept. This blotting paper is the same as that used in Water Resistance Test No 35-47.

(*2*). The iron temperature can be measured with a surface pyrometer or a 250°F Tempilstick (Cenco No 13756).

Calendar of Future Meetings

COUNCIL: Jan 18, April 18, June 13, Sept 19 (all in New York); Nov 6 (Boston).

GENERAL RESEARCH COMMITTEE: Dates and sites are the same as the Council's.

NATIONAL CONVENTIONS: 1952—November 6-8, Boston, Mass: 1953—Sept 17-19, Hotel Stevens, Chicago, Ill; 1954—Atlanta. Ga.

HUDSON-MOHAWK SECTION: Feb 1, Mar 21, May 2 (all at Jack's Restaurant); June 20 (Annual Outing).

MID-WEST SECTION: February 16 (Hotel Bismarck, Chicago, Ill); April 19 (Cincinnati, O); June 14 (Lake Lawn Lodge, Delavan, Wisc); October 4 (Hotel Bismarck, Chicago, Ill).

NEW YORK SECTION: Feb 29 (Hotel McAlpin, New York); April 18 (Swiss Chalet); May 16 (Swiss Chalet); June 20 (Outing).

NORTHERN NEW ENGLAND SECTION: Jan 25 (Boston); Mar 7 (MIT); April 18 (LTI); May 16 (Andover Country Club); June 6 (Annual Outing, Merrimack Valley Country Club); Dec 6 (1952 Annual Meeting, LTI).

PACIFIC SOUTHWEST SECTION: March 28, 1952.

PHILADELPHIA SECTION: March 7 (Penn-Sheraton Hotel, Philadelphia); April 25 (Abraham Lincoln Hotel, Reading, Pa); June 13 (Outing, Lu Lu Temple Country Club, North Hills, Pa).

PIEDMONT SECTION: Feb 1-2 (Robt E Lee Hotel, Winston-Salem, N C; April 25-26 (Clemson House, Clemson, S C); June 6-7 (Ocean Forest Hotel, Myrtle Beach, S C); Sept 12-13 (Hotel Charlotte. Charlotte, N C).

SOUTHEASTERN SECTION: Feb 23 (Alabama Power Company Auditorium, Talladega, Ala).

WESTERN NEW ENGLAND SECTION: Jan 25 (Rapp's Restaurant, Shelton, Conn); March 14 (Danbury, Conn); May 2 (Ladies Night, Cheshire, Conn); June 20 (Outing); Oct 3, Nov 14 and Dec 12 (Rapp's).

Mid-West Section and Intersectional Contest—

NEW DEVELOPMENTS IN THE DYEING OF SYNTHETIC FIBERS*

ALEXANDER P ROY
Superintendent of Dyeing and Finishing
Dean & Sherk Company, Inc, Lawrenceburg, Ky

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INTRODUCTION

THE dyers and finishers of twenty years ago had only cotton, rayon, wool, wool blends, and silk with which to contend, but today we have to cope with nylon, Dynel, Vicara, Saran, Dacron, Orlon, Acrilan, and a few more synthetic fibers, which have required, and still are requiring, a great deal of technical research for the proper application of dyes and various finishes. Dyers and finishers must meet many problems in finishing these new fibers today, whereas heretofore they concentrated mostly on perhaps four or five natural fibers.

The new synthetic fibers are far superior to the natural fibers in many important properties. During the war, emphasis was placed on strength and other mechanical characteristics in which synthetic fibers have a big advantage. Their dyeing properties were relatively unimportant. Cost was also unimportant since there was no limit to the price that would be paid for materials having the required qualifications.

In their present stage of development, nearly all the new fibers must be regarded as special-purpose, rather than general-purpose fibers. Even nylon, which has attained the largest volume of output of all the true synthetic fibers, is used principally for hosiery. The degree of specialization is also quite marked for other synthetic fibers.

This does not mean necessarily that the new fibers will remain special-purpose fibers. They are all undergoing intensive research and development sponsored by financially powerful corporations. Gradually they are being improved in properties, and their costs of production are being reduced, relative to the natural fibers. Man-made synthetic fibers are creating entirely different problems and have brought about entirely different situations in various textile mills.

The various machines that have been developed for these fibers during the past ten years have created a great deal of technical, as well as mechanical, research and development to make them suitable for present-day end uses. These fibers have also required a great deal of promotional sales work to establish a sales appeal to the public when the goods are finished.

Alexander P Roy

The author first reviews the qualifications that dyers and finishers must possess to cope with the technical and mechanical problems brought up by the development of many new synthetic fibers.

Recent improvements in processing and finishing these new fibers are discussed, especially the hydrophobic types. Illustrative formulas for preparing and dyeing various synthetic fibers are given, special emphasis being placed upon the new chemicals and procedures that are necessary.

An outline is presented for obtaining fast colors on nylon at high temperatures. Newer methods for processing Dacron and Orlon in both filament and spun form are given. The application of acetate dyes at high temperature on Saran is illustrated.

The dyeing of Vicara-wool blends to obtain good unions is discussed. The choice of suitable dyestuffs being especially emphasized. It is shown that yarns containing a blend of Vicara and wool knit best if dyed in package rather than skein form.

Now, in order to acquire a knowledge of the materials to be colored, one must carefully study the chemical and physical properties of the various fibers together with the manner in which they react when brought into contact with the various chemicals used in scouring, bleaching, dyeing, mordanting, finishing and allied processes. A thorough knowledge of the substances to be used as coloring agents is obviously necessary to the dyer, but it is only when these operations have been studied from a chemical point of view, and such knowledge is combined with a thorough acquaintance with the chemical nature of the fiber, that the highest proficiency is attained in the art of textile coloring.

Dyeing has been well defined as applied chemistry, and this is becoming truer every day. Modern dyeing demands of the present-day dyer an increasing knowledge of advanced organic, inorganic and physical chemistry. A well-equipped laboratory and a competent chemical staff are absolutely necessary for the efficient running of a dye house. Not only does the dyer require an expert knowledge of the properties of the chemicals and dyestuffs used in dyeing, coupled with a knowledge of preparatory and finishing processes through which the material passes, but he has also to possess a sufficient knowledge of chemistry to understand the chemical processes involved in the application of modern coal-tar dyestuffs and chemicals which are coupled together to make them suitable in regard to application procedures, such as their affinity for new fibers, exhaustion properties, their fastness properties and many more properties to meet consumer's standard requirements.

The reason that I have mentioned these facts to you today is that I have a few samples to exhibit, and some formulas to show you for processing various synthetic yarns. These samples should be very interesting because of the unconventional methods by which they were processed to obtain satisfactory end results.

* Presented before the Mid-West Section in Chicago on September 19, 1951; also presented by Mr Roy as the entry for the Mid-West Section in the Intersectional Contest at the Thirtieth Annual Convention in New York on October 19, 1951.

DYEING PROCEDURES

NYLON—First, we shall take the nylon samples. Nylon, a synthetic polymeric amide or synthetic-resin fiber, today can be dyed with any one of several groups of dyestuffs. Acid, chrome, acetate, neutral, vat, naphthol and other dye classes exhibit very good fastness properties in most every respect on nylon. For example, nylon dyed at high temperature by our Hyperthermalized Process *(1)* shows excellent color depth and excellent fastness to preboarding, cross dyeing, and washing. This method of dyeing has the advantages of using less dyes and chemicals and of taking less time in processing.

Nylon yarns should be scoured free of oil and size prior to being dyed by the Hyperthermalized Process. This may be accomplished by the use of 2 to 3% of a good scouring agent and 1% of TSP at 180°F to the boil for at least 15 minutes.

The scoured nylon is entered into the dyebath at a temperature of 120 to 140°F, and the temperature is raised gradually to 200°F. The machine is then closed, the temperature is raised to 250°F, dyeing is continued at this high temperature for 20 to 30 minutes, and the dyeing is finished with 2% of a cationic softener or antiseptic finish.

2% Diamine Scarlet B, Pr 382
½% Acetic acid, 56%

A resist brown is dyed on filament nylon by the following formula:

1 % Erio Chromal Orange ML, Pr 457
1 % Erio Chrome Yellow ME,
3.5% Erio Chrome Brown RLL
4 % Acetic acid, 56%

Dyeing is carried out for 45 minutes at 200°F. The dyed goods are rinsed, chromed over at the high temperature of 230 to 240°F for 20 minutes with the following amounts of chemicals and finally rinsed again:

3% chrome
1% acetic acid, 56%

To achieve the best fastness to repeated severe washing, chrome, vat or azoic dyes must be used. In the after-chrome method of dyeing nylon, the use of a reducing treatment after the chroming stage insures maximum metallization of the dye within the nylon, completely removes residual dichromate, improves fastness to washing, and increases the fastness to preboarding. Sodium thiosulphate is used in this reducing treatment.

In the dyeing of the chrome colors, the dye is applied with 3% of formic acid, the color is developed or chromed with 3 to 4% of chrome for 45 minutes, and finally treated with 4% of sodium thiosulphate for 20 minutes.

Capracyl colors are applied to nylon by our Hyperthermalized Process *(1)* at a temperature of 250°F under pressure in a circulating bath in the presence of 1% of Duponol LS Flakes; an acidic assistant like acetic acid or ammonium acetate is not necessary.

The following Capracyl dyes give deep shades at 2% owf:

Capracyl Yellow N
Capracyl Yellow 3 RD
Capracyl Orange R
Capracyl Brown RD
Capracyl Red B
Capracyl Violet R
Capracyl Blue G

The following tests on the above colors show that they possess much better color fastness than would be produced on the average by the dyestuffs commonly employed for nylon fibers; in addition they have the advantage of being readily stripped:

I Stripping with Sulfoxite S
Most colors are stripped fairly satisfactorily from 2% dyeings by treatment for 1 hour at 200°F with the following:
10% Sulfoxite S Conc
5% Acetic acid, 28%

II Fade-Ometer for 50 to 100 hrs:
Excellent fastness in all shades after 100 hrs.

III #3 Synthetic Wash (AATCC),
With cotton, spun-nylon and filament-nylon effects:
Little shade change throughout;
Cotton unstained;
Filament nylon stained trace to noticeably;
Spun nylon stained noticeably to appreciably.

IV Dry and moist crocking:
Dry crocking is in general fairly good;
Moist crocking requires improvement in several shades, but is better than that expected from chrome colors, which are commonly used on nylon.

A fast black is dyed on nylon according to the following formula:

FAST BLACK ON NYLON

Scour yarn as previously suggested.

Mordant with 1% bichromate and 3% acetic acid, 28%.

Start mordanting at 120°F, gradually raise temperature to the boil and then to 230°F under pressure and run for ½ hour at 230°F.

Wash yarn clean in cold water and prepare dyebath with 25% oxidized logwood in crystal form and 5% soap.

Start dyeing at 120°F, raise temperature to 230°F and continue dyeing for 1 hour under pressure.

Wash yarn and resist it.

SARAN—Saran is a vinylidine-chloride filament, a fiber which has outstanding characteristics in its resistance to chemicals and solvents. At room temperature it is extremely resistant to all acids and common alkalies, except concentrated ammonium hydroxide. When exposed to concentrated sulfuric acid or caustic soda over long periods, Saran is subject to only slight discoloration with little change in mechanical properties. It is swelled or softened only by oxygen-bearing organic solvents (dioxane). Its resistance to chemicals or solvents decreases as the temperature rises.

Being a thermoplastic material, it has a definite softening point, which limits the temperature at which it can be used. Like other thermoplastic fibers, it can be permanently deformed by heat and pressure at temperatures somewhat below the softening point of other fibers. Since the softening points of Saran vary with composition, the upper limit of operating temperature can be varied from 150 to 250°F.

Like most hydrophobic fibers, such as Orlon and Acrilan (both acrylic fibers), Saran has extremely low water absorption and vapor transmission. Over a period of 24 hours, it shows water absorption of only 0.02 to 0.05%. This accounts for its dimensional stability and freedom from warpage under a wide range of moisture-exposure conditions.

Saran, because of its impervious nature, does not take to dyes by the conventional dyeing methods. However, the use of certain acetate dyes has shown fairly good results. The following formulas and methods of color application exhibit a fairly decent range of shades:

SPUN CARPET YARN DYED LIGHT BLUE

Scour yarn at 180° F for 30 minutes in a pressure or package machine at a ratio of 8:1 with 2% of scouring agent. Prepare the dyebath with

1% Artisil Direct Blue GFL
0.01% Cellintonfast Pink RFD—CF
1% dyeing assistant

Start dyeing at 130° F, run for 10 minutes, raise temperature to 180° F, and run 1 hour at 20 pounds of pump pressure. Rinse dyed yarn, scour at 180°F for 10 minutes, and finish.

NAVY-BLUE SHADE

2% Artisil Blue GFL
8% Celanthrene Violet BGF
0.5% Acetamine Yellow 4 RL

Start dyeing scoured yarn at 160° F, run 15 minutes, raise temperature to 210° F, and run for 1 hour at 20 lb of pump pressure. Rinse and scour at 180° F for 10 minutes.

SCARLET SHADE

2.5% Acetamine Scarlet B, Pr 244

Run same as navy-blue shade.

The next sample is on filament Saran, dyed black. The dyeing procedure was the same as previously mentioned except that the yarn was dyed at 250°F, at a pressure of 30 pounds.

BLACK ON SARAN

5.1% Celanthrene Violet BGL
2.0% Celanthrene Blue FFS Pr 228
1.0% Acetamine Orange GR Pr 43

Please note that the filament Saran is very wiry and stiff from having been processed at high temperature and pressure. Under such conditions this thermoplastic fiber softens and then remains permanently deformed upon cooling.

VICARA—Vicara is a protein fiber made from zein, the protein of corn (maize). It is therefore not truly synthetic but is rather a regenerated protein fiber, which is much more resistant to chemical action than most of the previously regenerated protein fibers. It can withstand carbonizing, neutralizing, fulling, etc, better than most protein fibers. This is one reason that Vicara has become so popular as a blend with wool.

Various selected types of dyestuffs have shown good affinity on Vicara, such as acid, chrome, acetate, neutral, and metallized dyes. The acid and chrome dyes have a tendency to react or show up very different on Vicara, especially when blended with wool. Unions with wool do not give solid shades unless colors are properly selected, many two-tone effects being obtained with most dyes. A dyer must become well versed in the selection as well as the application of dyestuffs on blends of Vicara and wool to get uniform results. This is especially true for knitting yarns. A proper selection of acid colors will cover a good range of shades in knitting yarns.

Vicara has a natural yellowish shade, which can be bleached to obtain fairly decent bright shades. The depth of color of unbleached Vicara is illustrated by the fact that ½ to 1% of Acid Violet BG gives a greenish shade. A regular peroxide wool bleach on Vicara or a blend of Vicara and wool gives a reasonably good white, which is satisfactory for dyeing most shades. An excellent white base suitable for the dyeings of pastel pinks and blues can be obtained by the following procedure:

4 to 6% Sulfoxite S Conc (a wool stripper)
5% acetic acid, 28%
Run ½ to ¾ hour at 170° F.
Rinse and scour in the presence of Calsofluor White R-W, ½ oz per 100 lb of yarn

Another interesting property of Vicara-wool blends is the effect of various methods of dyeing on the knitting characteristics of yarn. For example, the dyeing of yarns of these blends in package equipment leaves them in a much better condition for knitting than the dyeing of yarns in skein-dyeing equipment. Skein dyeing apparently causes the wool to shrink and gives a slight crimped effect on the Vicara, which in turn causes knitting problems. At least, package-dyed blended yarn knits much better. Blended yarn wound on a dytex tube seems to be held in a taut position with elimination of differential shrinkage.

DACRON—Dacron (formerly Fiber V) is a polyester fiber of terephthalic acid and ethylene glycol, which resembles nylon in many ways. The dyeing of Dacron, however, has presented many problems to dyers and finishers because this fiber, like Orlon, is hydrophobic, that is, has a very low water absorptivity and has a correspondingly low affinity for most commercial dyes.

Although a full range of shades can be obtained on Dacron with acetate and azoic dyestuffs, the use of carriers and good judgment in the proper selection of these dyes must be exercised for processing, regardless of whether it is in high-temperature dyeing or in dyeing at atmospheric pressure. Not only should the colors have affinity for the fiber, but they must not be volatile under the conditions of fixation or adversely affected by heat, that is, they must be resistant to sublimation.

Originally, the addition of benzoic acid (about 20 grams per liter) as a dyeing assistant was necessary to obtain maximum color value and leveling effects. However, the same corresponding shades can be obtained at 250° F without carriers and with at least 25 to 30% less dyestuff.

Recently the use of paraphenylphenol and orthophenylphenol as swelling agents or carriers has produced good dyeing results, but the light fastness of most colors is affected to the extent that they show up as very poor in a Fade-Ometer test. Among both the acetate and azoic groups, however, there is a limited selection of dyes that produce fairly decent fastness to light. The darker or heavier depths of shade exhibit fair to good fastness to light.

As mentioned before, some colors have a tendency to melt or sublime at certain temperatures and to form an outside coating on the fiber, which rubs off, or crocks. For example, Celanthrene Violet BGF and Artisil Direct Orange 2R have good affinity on Dacron, but, when they reach a certain temperature, the colors melt and cause crocking and poor wash fastness. The sublimed color can be removed, however, by a light strip with 4% of Sulfoxite S and 2% of acetic acid at 180° F for 15 minutes. For heavy dyeings this stripping procedure has very little effect on the shade and removes the excess color sufficiently to give excellent wash fastness.

The following formulas are those used in dyeing Dacron with both acetate and diazo colors. I have tried to use the best color selections for dyeing this fiber at 250° F by the methods described below:

NAVY BLUE WITH ACETATE COLORS

Wet out for 15 minutes at 140° F with 0.5% of scouring agent and rinse with warm water.

Dye bath is set with
5.785% Celanthrene Violet BGF,
2.661% Celanthrene Brill Blue FFS Conc,
0.372% Acetamine Fast Yellow 4RC and
0.5% detergent.

The color is first pasted with a dispersing agent, then diluted with water at 180° F. After complete dispersion, the dye is strained into the machine and the temperature is raised to 250° F. The dyeing is carried out for 45 minutes and then finished as follows:

1) Hot wash 10 minutes at 200° F.
2) Scoured 20 minutes at 200° F with scouring agent.
3) Hot rinse until clear.

NAVY BLUE WITH DIAZO COLORS *(2)*

I Wet out 10 minutes with 0.5% of scouring agent. Rinse at 140° F.
To fresh bath at room temperature to 100° F add 5% Acetamine Diazo Black 3B wet out with 2% Alkanon DW.
Raise to 200° F during 15 minutes.
Close off expansion tank. Raise to 250° F in 10 minutes.
Dye one hour @ 250° F.
Drop and rinse at 120° F.
Scour 10 minutes at 160° F with 2% of caustic soda.
Rinse at 120° F.

II Add to fresh bath at room temperature 2.5% Acetamine Developer AD Ex.
Run 45 minutes at 200° F. Drop bath and rinse goods at 120° F.

III Diazotize in fresh bath for 30 minutes at 190° F with
10% sodium nitrite
20% sulfuric acid
Drop bath and rinse at 120° F.

The above formulas and methods of procedure are also practical on filament Dacron to obtain a wide range of shades.

ORLON—Orlon, an acrylic fiber manufactured from polyacrylonitrile, is also classified as a hydrophobic fiber because of its very low water absorptivity and low

affinity for most commercial dyes. Orlon has extremely good resistance to degradation by heat and by many chemicals, particularly mineral acids. Because of these characteristics, Orlon can be dyed at high temperatures with carriers and the use of buffers. Recently there have been some very interesting developments in the application of newer and more economical methods of dyeing Orlon.

The new type-41 staple, as well as the type-81 continuous filament, is dyeable by a technique with cuprous copper similar to that recently developed by Carbide & Carbon Chemicals Division of Union Carbide & Chemical Corporation for dyeing their acrylic fiber, Dynel. Originally we were limited to acetate, indigoid and thiondigoid vat colors and a few basic colors, but today we have been successful in dyeing a good range of shades with this cuprous-ion method.

The use of acetate colors on Orlon at 250° F has not given good build up of color or exhaustion in deep shades, but a few vat dyes dye Orlon at high temperature to produce deep shades. This method is very costly compared with the new cuprous-ion method. Where light fastness is required, the vats prove the best, although both the vat and the cuprous-ion methods give dyeings with very good wash fastness.

I would like to give you a comparison of a vat black obtained at high temperature with a black obtained with copper sulfate and hydroxylammonium sulfate and phenol.

VAT BLACK 140 PACKAGES 140 LBS YARN 10-1 RATIO *(2)*

Reducing Bath

34 lbs 12 oz Sulfanthrene Black Pr Dbl Paste

4 lbs 11 oz caustic soda (1⅞ oz per gal)

5 lbs 7 oz hydrosulfite (2-1/6 oz per gal)

1 lb 14 oz turkey red oil

Reduce 15 minutes at 160° F in volume of 40 gallons.

Spring Bath

1 lb 14 oz turkey red oil

4 lbs 11 oz caustic soda

4 lbs 11 oz hydrosulfite

7 lbs 8 oz Sulfoxite S

Run 15 minutes at 180° F.

Drop 40 gallons.

Add reduced color. Run 5 minutes.

Add 20 lbs 10 oz potassium bicarbonate.

Run 15 minutes at 180° F.

Add 37 lbs 8 oz common salt.

Run 15 minutes.

Close expansion tank and raise temperature to 250° F.

Run 1 hour. Sample.

CUPROUS ION METHOD—BLACK *(2)*

Scour yarn and rinse it with warm water.

Set dyebath with

2.01% Quinoline Yellow PN Ex Conc

2.01% Orange RO

6.32% Anthraquinone Blue SWF Conc 150% PP

1.89% Pontacyl Violet 6 R Conc 150%.

Raise temperature to 170° F.

Add 4% copper sulfate and 3% hydroxylammonium sulfate.

Circulate 10 minutes, close off expansion tank.

Heat to 250° F.

Dye 1 hour, drop bath and rinse.

Yarn is soaped for 15 minutes at 195° F.

Most acid colors seem to decompose considerably after several minutes of boiling. The addition of phenol about five minutes before the temperature is raised to 250° F acts as a stabilizer and reduces the decomposition of color.

Please note the difference in percentage used in both methods indicating that a considerable saving was obtained in the use of the cuprous-ion method.

REFERENCES

(1) Dean and Sherk Company's *Hyperthermalized Process*, patent pending.

(2) Formulas were established with the cooperation of Merit Goodell, Technical Division, E I du Pont de Nemours & Company, Inc.

Membership Applications

SENIOR

Clovis D Allen—assistant dyer, Mandeville Mills, Carrollton, Ga. Sponsors: H G Smith, F X Nerney.

Mark Q Branniff—dyer, Webster Mills, American Woolen Co, Inc, Webster, Mass. Sponsors: A Morrison, H D Grimes.

Arthur Cresswell—synthetic fibers group leader, American Cyanamid Co, Stamford, Conn. Sponsors: J E Lynn, N J Glade.

Bernard W Crowe—textile technologist, American Cyanamid Co, Stamford. Conn. Sponsors: J E Lynn, N J Glade.

Martha E Jungerman—assistant professor, Philadelphia Textile Inst, Philadelphia, Pa. Sponsors: J A Hennessey, R P Monsaert, Jr.

Hubert H Marty—senior development engineer, B F Goodrich Chemical Co, (Experimental Station) Avon Lake, O. Sponsors: J H Hennessey, G A Jonic.

Robert C Ramsay — consulting chemist, Robert C Ramsay Associates, Reading, Pa. Sponsors: P J Luck, G L Baxter.

Stale Rotevatn—demonstrator and salesman, dyestuffs, Dr Ing Falkenberg A/S, Lovenskioldsgt 1, Oslo, Norway. Sponsors: C A Sylvester, C K Black.

Louis M Wise—research chemist, Hercules Powder Co, Wilmington, Del. Sponsors: R P Monsaert, Jr, P J Kennedy.

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Harold B Walker—lab dyer, Develop Fin Plant, Burlington Mills Corp, Greensboro, N C.

Applications for transfer to Senior Membership

Maurice Fishman
Ricardo Jaramillo
Gordon Loeb
Cameron Mackenzie
Pauline F Riordan
Albert E Tamosauskas
John D Williams

(Additional applications on Page P46)

30th Annual Convention
Dyeing Group——

THE COPPER METHOD FOR DYEING ORLON* ACRYLIC FIBER**

R H Blaker and J F Laucius

Jackson Laboratory
E I du Pont de Nemours & Co, Inc
Wilmington, Delaware

INTRODUCTION

THE copper dyeing method, first described by Feild and Fremon of Union Carbide and Carbon Corporation *(1)*, represents a novel and useful solution to the problem of dyeing synthetic fibers that are composed of acrylonitrile interpolymers. Contrary to statements made by these authors, the copper method is applicable to fibers composed entirely of acrylonitrile as well as to the various interpolymers. The unique feature of this new procedure for dyeing is that copper in the cuprous valence state is employed as an assistant for dyeing with acid and direct colors.

The dyeing procedure required by the copper method is, in principle, very simple. The copper may be added to the dyebath in the form of cuprous salts, but, since the cuprous ion is not very stable in aqueous solution, it is preferable to add a cupric salt and a suitable reducing agent to produce the cuprous ion at approximately the same rate as it is absorbed by the fiber. A wide variety of acid and direct colors may be used. The principal requirement for the dye appears to be at least one sulfonic acid or carboxyl group in the molecule; more than one acid group in the molecule seems to reduce the dye affinity.

The copper method has made possible the dyeing of Orlon* Type-41 acrylic fiber in a full range of shades with satisfactory fastness properties. A satisfactory dyeing procedure for Orlon has been developed, and progress has been made in understanding the mechanism involved in copper dyeing.

R H Blaker

Copper salts have been studied as assistants in dyeing Orlon acrylic fiber. These studies have led to the development of a satisfactory dyeing procedure for polyacrylonitrile fibers in general. This process requires formation of a cuprous salt of an acid dye within the fiber. Cuprous ion is first absorbed by Orlon fiber, and forms bonds with certain nitrile groups. A dye anion then forms a salt with one of the cuprous ions thus bound. The absorption of cuprous ion by Orlon fiber and the absorption of acid dye by the coppered fiber can be represented by simple equations. In practice cuprous ion is formed in the dye bath by reduction of copper salts. Hydroxylamine sulfate has proven to be a satisfactory reducing agent and avoids the usual tendency of cuprous ion to form metallic cooper and cupric ion. Temperature, pH of dye bath and concentration of cuprous ion have a pronounced effect on the rate of dyeing.

SELECTION OF A REDUCING AGENT——In principle, any reducing agent powerful enough to reduce cupric copper to the cuprous state may be used in the copper dyeing method; in practice, the choice of reducing agents is limited to those which do not destroy the dyestuff and to those which reduce the copper at approximately the same rate as it is absorbed by the fiber.

The sodium and zinc formaldehydesulfoxylates effectively reduce cupric salts, but they also attack certain classes of acid colors. It is possible to avoid this destruction of color by pretreating the fabric in a bath containing the cupric salt and the reducing agent, destroying the excess reducing agent, and then adding the dye. However, even when the pretreatment procedure is followed, extreme care must be exercised when the formaldehydesulfoxylates are used to avoid the formation of metallic copper in the dyebath. At temperatures above 170°F, these reducing agents form cuprous copper faster than it can be taken up by the Orlon acrylic fiber. If the concentration of cuprous ion in the bath exceeds a certain amount, the cuprous ion disproportionates into cupric ion and metallic copper. When metallic copper is formed in the dyebath, it precipitates on the fiber and on the dyeing equipment as a finely divided powder, which causes a weak, uneven dyeing contaminated with finely divided metallic copper.

It is possible to stabilize the cuprous ion in solution by the addition of agents that can form soluble complex ions with cuprous copper. Hydroxylamine sulfate has been found to be particularly useful in the copper dyeing method since, in addition to reducing the cupric salts, it forms a soluble complex ion with the cuprous ion. The stability of this complex is such that the cuprous ion is readily available for absorption by Orlon.

While formaldehydesulfoxylates must be used with great care and any excess removed to avoid destruction of color, hydroxylamine sulfate appears to be perfectly safe, causing no significant color decomposition. Copper dyeings made with hydroxylamine sulfate proceed smoothly, and no particular care has to be exercised in adding the color or in controlling the rate of heating of the dyebath.

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* "Orlon" is the trade-mark for acrylic fibers manufactured by E I du Pont de Nemours & Company, Inc.

** Presented by R H Blaker in New York on October 17, 1951.

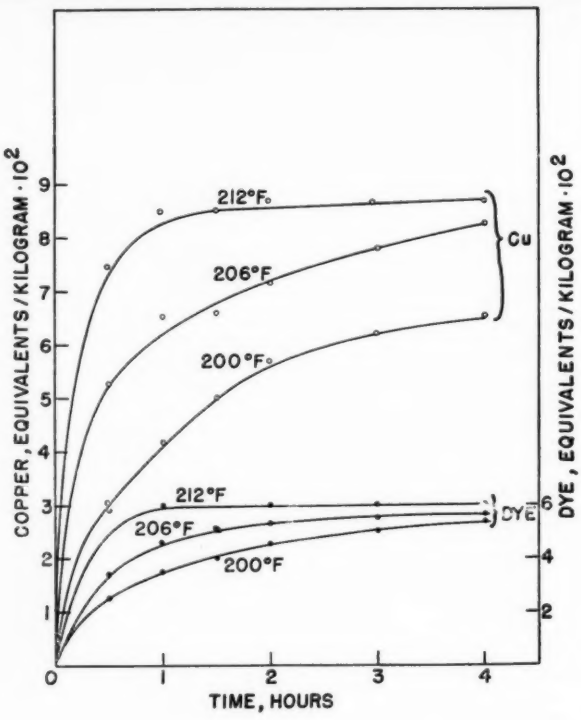

Figure 1
Variation of Rate of Absorption of Copper and Acid Dye with Temperature

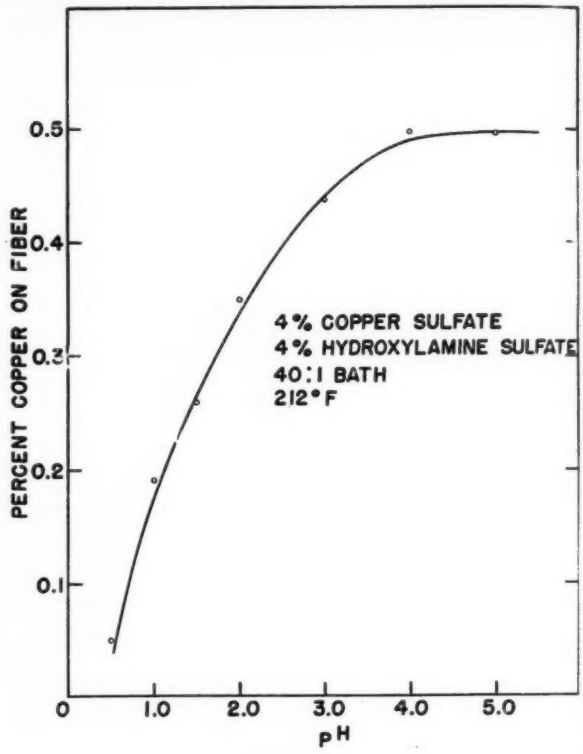

Figure 2
Variation of Absorption of Copper with pH

EXPERIMENTAL

CONDITIONS FOR DYEING——The simultaneous rates of exhaustion of cuprous ion and of an acid dye from a typical dyebath are shown in Figure 1. These data indicate that the rate of absorption of copper is the controlling factor in the dyeing. The over-all rate of dyeing is much greater at 212°F than at 206°F or 200°F and, in practice, dyeings made by the copper method should be as close to 212°F as possible if adequate exhaustion is to be achieved in a reasonable length of time.

The amount of cuprous ion absorbed and hence the dyeability of Orlon acrylic fiber depends on the pH of the dyebath as shown in Figure 2. Successful dyeings can be made in the pH range of 1.5 to 5, although, in practice, it is desirable to maintain the pH between 2 and 3. The coppered fabric has a tendency to become yellow if the pH of the dyebath is greater than about 3; if the pH is much less than 2, there is too little copper absorbed to give satisfactory dyeings.

The absorption of copper by Orlon is apparently an equilibrium process. The distribution of cuprous ion between fiber and bath in the absence of dye is shown in Figure 3. As shown, the equilibrium absorption of cuprous ion is essentially constant over a fairly wide range of temperatures, while the rate of copper absorption, given in Figure 1, is strongly dependent upon the temperature.

The rate of dyeing is influenced by the nature of the salts added to the dyebath. The rate in the presence of hydroxylamine sulfate and cupric sulfate is satisfactory but may be much less if certain other ions, particularly those that can form complex ions with cuprous copper, are present in the dyebath. Hydroxylamine hydrochloride, for this reason, is not suitable as a reducing agent; in addition, it may be well to avoid the use of dyes that are standardized heavily with sodium chloride.

PRESENT STATE OF THEORY OF COPPER DYEING——The mechanism of copper dyeing is best considered as involving two separate and distinct reactions. Cuprous ion is first absorbed by Orlon acrylic fiber, forming co-ordinate bonds with selected nitrile groups. The second reaction involves the formation of a salt between the dye anion and the weakly bound cuprous ion. In any actual dyeing, both of these reactions go on almost simultaneously.

The main features of the copper dyeing method are illustrated by Figure 4. This figure shows the changes that take place during dyeing in a dyebath which originally contained cupric sulfate, hydroxylamine sulfate, pure sodium salt of an acid dye, and Orlon. Cuprous ions are first absorbed by the Orlon and, because of the requirement of electrostatic neutrality for the fiber, are followed by sulfate ions and dye anions. Since the diffusion constant for sulfate ion in the fiber is greater than for dye anion, sulfate ions will be absorbed more rapidly in the initial stages of the dyeing. Eventually the dye anion, because of its intrinsically greater affinity for coppered Orlon, will begin to displace the sulfate ion from the fiber and the concentration of sulfate ion in the bath will increase. The difference in the rates of absorption and of the affinity for sulfate and dye anion accounts for the minimum in the sulfate ion absorption curve.

The relative amounts of copper and the accompanying anion that are absorbed in the absence of dye provide evidence for the valence state of the copper as it exists in the fiber. In experiments in which only copper and chloride ion are absorbed, the ratio of copper to chloride on the fiber was found to be in unity, as would be expected if monovalent copper is absorbed.

The absorption of cuprous ion by Orlon acrylic fiber appears to be an equilibrium reaction resulting in the formation of co-ordinate bonds between cuprous ion and the nitrile groups of the polyacrylonitrile.

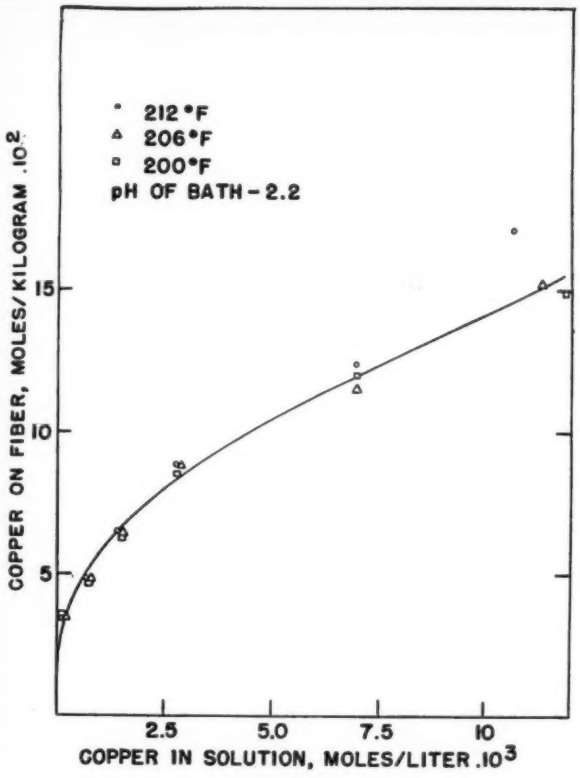

Figure 3
Equilibrium Between Copper in Solution and Copper Absorbed by Orlon

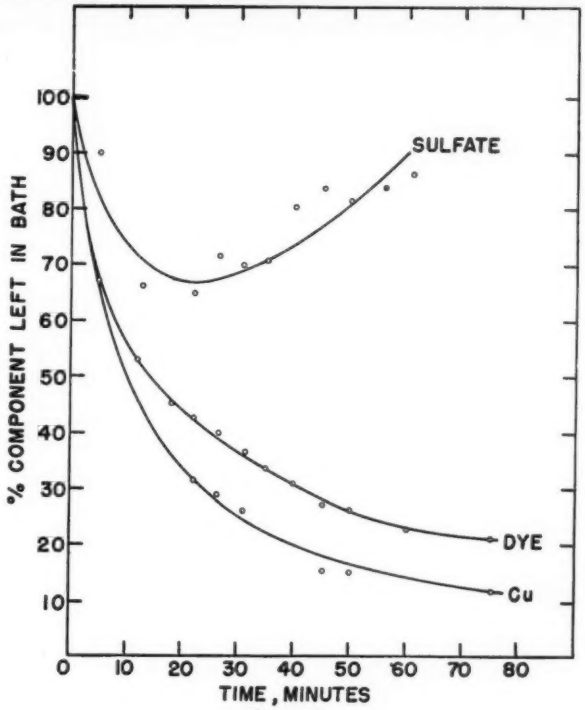

Figure 4
Changes in Composition of Experimental Dyebath During Dyeing

The following expression is consistent with the data for the absorption of cuprous ion by Orlon in the absence of dye over a limited concentration range and at constant pH:

$$Cu^+ A^- + B \rightleftarrows Cu\,AB \qquad (1)$$

Where Cu^+ is the cuprous ion in solution, which is represented in equation 1a by Cu_S;

A^- is the anion associated with the cuprous ion;

B represents a site for copper absorption in Orlon; and

CuAB is Orlon-combined copper, which is represented in equation 1a by Cu_F.

An equilibrium constant for equation (1) may be written as follows:

$$K = \frac{[Cu_F]}{[Cu_S]\ [B]} \qquad (1a)$$

If the total number of sites for copper absorption on Orlon is S, then

$B = (S - Cu_F)$ and equation 1a becomes

$$K = \frac{[Cu_F]}{[Cu_S]\ [S - Cu_F]} \qquad (1b)$$

Equation 1b may be rearranged in the form of an equation for a straight line as follows, in which $1/[Cu_F]$ is written on the y-axis and $1/[Cu_S]$ is written on the x-axis:

$$\frac{1}{[Cu_F]} = \frac{1}{K[S]\ [Cu_S]} + \frac{1}{[S]} \qquad (2)$$

The absorption of copper by Orlon acrylic fiber has been replotted in terms of equation 2 and is shown in Figure 5. The data indicate that, within the experimental error, temperature has little effect on the amount of copper absorbed at equilibrium. This negligibly small temperature dependence of copper absorption indicates that the heat of reaction between cuprous ion and Orlon is small; hence, the strength of the co-ordinate bonds between cuprous ion and the nitrile groups must be small.

The absorption of copper by Orlon obeys equation 2 very well over the range of cuprous-ion concentrations normally used in a dyebath; at higher concentrations more copper is absorbed than would be predicted. The data are consistent with the hypothesis that there are two sites in Orlon which can absorb cuprous ion independently. Certainly not all the nitrile groups in Orlon are involved in the reaction with cuprous ion since even at saturation there is on an average only one cuprous ion absorbed for each 20-25 nitrile groups. It is known that low-molecular-weight nitriles, for example, acetonitrile, can form two series of complex compounds with copper in which either two or four nitrile groups are co-ordinated with each cuprous ion *(2)*.

The nature of the two kinds of sites is not known, but it is conceivable that they may involve nitrile groups near the ends of the molecules or some unusual spacing of nitrile groups along the molecule chain because of branching or other abnormalities in the polymerization.

The absorption of cuprous copper confers on Orlon acrylic fiber an affinity for selected acid and direct colors. The absorption of dye by coppered Orlon over a limited concentration range can be represented by a simple expression.

$$D^- + E \leftrightharpoons DE + A^- \qquad (3)$$

Where D^- is the dye anion in solution, or D_S in equation 3a;

E is free dyeing site consisting of complex combination of Orlon with cuprous ion and simple anion;

DE is dye combined with coppered Orlon, or D_F in equation 3a; and

A^- is simple anion in solution, which is represented by A_S in equation 3a.

The equilibrium constant for the reaction may be written as follows:

$$K = \frac{[D_F]\ [A_S]}{[D_S]\ [E]} \qquad (3a)$$

If S is the total number of dyeing sites on Orlon acrylic fiber, then $E = (S - D_F)$ and equation 3a becomes

$$K = \frac{[D_S]\ [S - D_F]}{[D_S]\ [S - D_F]} \qquad (3b)$$

which may be arranged in the form of an equation for a straight line, in which $[D_F][A_S]/[D_S]$ is written on the y-axis and $[D_F]$ is written on the x-axis:

$$\frac{[D_F]\ [A_S]}{[D_S]} = K[S] - K[D_F] \qquad (4)$$

Data for the absorption of the blue acid color, 1-amino-4-anilino-anthraquinone-2-sulfonic acid on coppered Orlon acrylic fiber at 100°C are shown in Figure 6. The data agree very well with equation 4 over a limited range of dye concentration. The extrapolation of the data to an intercept on the D_F axis gives the value of S which, as shown in equation 4, represents the total number of dyeing sites in coppered Orlon. The value of S determined from Figure 6 agrees very well with the amount of copper on the samples of fiber as found by direct analysis. This agreement indicates that, when coppered Orlon is saturated with a monosulfonic acid dye, there is one dye molecule associated with each cuprous ion on the fiber.

The addition of a salt containing the common anion to the dyebath reduces the amount of dye absorbed by the fiber as is predicted by equation 4. For example, when copper sulfate and hydroxylamine sulfate are used, the addition of sodium sulfate to the dyebath does not aid in exhausting the bath but actually results in a weaker dyeing.

SUMMARY

The copper dyeing procedure can be used with selected acid and direct colors to dye fibers that contain polyacrylonitrile.

The action of a reducing agent is the most critical feature of the copper dyeing procedure. Hydroxylamine sulfate has been found to be a satisfactory reducing agent for use in both laboratory experiments and in large-scale mill dyeings.

The mechanism of dyeing involves the formation of a cuprous salt of an acid dye within the fiber. Cuprous ion is first absorbed by Orlon to form co-ordinate bonds with selected nitrile groups, which are apparently arranged in a specific configuration; the dye then forms a salt with the weakly bound cuprous ion. Each cuprous ion absorbed provides one potential dyeing site for a monovalent dye anion. The absorption of cuprous copper by Orlon acrylic fiber and the absorption of acid dyes by coppered Orlon can be represented by simple expressions.

ACKNOWLEDGMENTS —— Grateful acknowledgment is made of many helpful discussions with Dr C A Young, Dr James Hyde and Dr H E Schroeder of this laboratory.

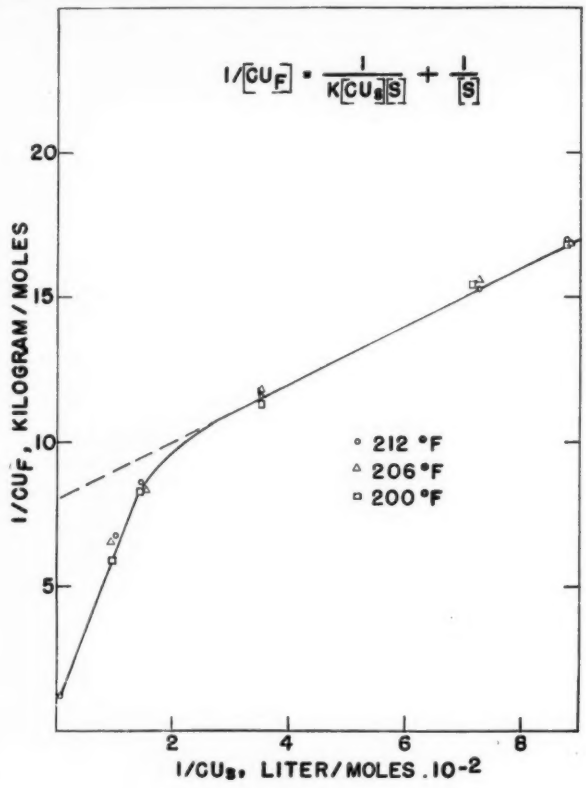

Figure 5
Absorption of Copper by Orlon Acrylic Fiber

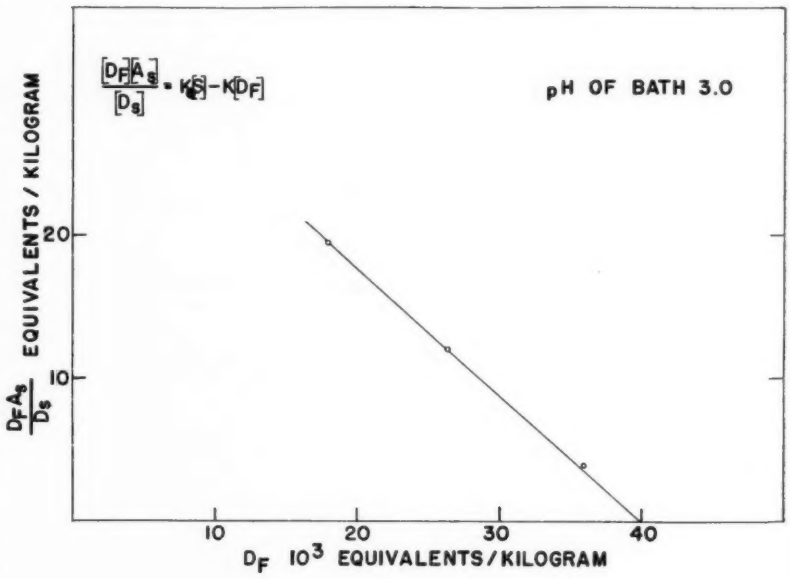

Figure 6
Absorption of Dye by Coppered Orlon Acrylic Fiber

REFERENCES

(1) Feild, T A, Jr and Fremon, G H, Abstracts of papers presented at Annual Meeting of Textile Research Institute, November 16, 1950, New York.

(2) Morgan, H H, *J Chem Soc* 123, 2901-7 (1923).

DISCUSSION

Question: I believe that the experiments presented agree very well with the basic concept suggested for the mechanisms of the reactions. My comment is with respect to the absorption of copper. I think that the electrical potential on the fiber has not been considered in its effect as a limiting factor on absorption of cuprous ions. The second step is the exchange of gegen ions, sulfate or chloride, whichever it may be. I think the electrical forces should have received consideration as in the work of Gilbert and Alexander and others.

Answer: Along with Figure 4 I remarked that the positive cuprous ion is attracted by coordinate valence forces on the fiber but that an anion must accompany the positive ion if a positive electropotential is not to build up on the fiber.

Q: It is obvious that electric neutrality of the fiber must be maintained. Yet anions are not attracted to the fiber as are the cuprous ions, and therefore the attraction for cuprous ions must decrease as some of the sites become filled.

Q: In the chrome dyeing of wool the chromium produces a greenish bottom on the fiber and limits the brilliance of the colors that can be obtained. Can the cuprous-ion process be considered analogous?

A: It is interesting that many metals appear greenish on wool besides chromium, as for example, copper. The color of cuprous copper on Orlon in the normal amounts used for dyeing within the pH range of 2 to 3 is not noticeable. If the pH range is increased above 3, we do get a yellowing of fiber and a dulling of the color in light shades

Minutes of Piedment Section Research Committee Meeting

December 9, 1951
Hotel King Cotton, Greensboro, N C

THE Research Committee of the Piedmont Section met at the Hotel King Cotton, Greensboro, North Carolina on Saturday, December 9, 1951. Dr H Y Jennings, Chairman, presided. Members present were:

H Y Jennings	Clarence Hooper
R H Souther	J L Lindsay, Jr
M M McCann	F K Burr
J B Neely	N A Truslow
F W Sturtevant	D L Worth
R A Bruce	W T Rainey
R G Lawrence	H L Mercer

The minutes of the previous meeting at Charlotte were read and approved.

Present and future research projects leading to Intersectional Contest Papers were discussed as follows:

A study of antistatic agents for Dacron and Orlon will be initiated. The effects of different types of compounds will be measured on fabric as to charge developed and rate of discharge. Mr Neely will gather the materials for study and turn them over to Professor Lindsay who will direct the evaluation at Clemson. Other means of discharging static, such as ionization, were discussed and may lead to other avenues of investigation.

Work is continuing on the current paper dealing with urea-formaldehyde resin catalysts evaluation. Mr Rutherford and his associates at North Carolina State College are gathering data of resin bath stability and a study of the method of analysis of fixed resin content. It is also planned that studies will be made on rayon fabric as was done earlier on cotton. It may be necessary to find another style of rayon fabric for this work since the fabric on hand seems to show a high crease recovery angle before treatment. Another potential problem concerning both the estimation of crease recovery angle and resin fixation is that of conditioning. This, however, may be the basis for another research problem.

A study of significance of various tear testing methods of resin-treated fabrics is the subject of an additional paper for future use. An outline for the project has been submitted. It is proposed that three viscose rayon fabrics (and possibly cotton) be treated with low, moderate and high concentrations of resin and compared with untreated samples; also, that softeners would be applied to determine the effect on tear strength at high resin concentration. Treatments will be run at North Carolina State College. Dr Jennings will take care of locating fabrics for the work.

The following test methods will be studied at the indicated laboratories:

(a) ASTM Tongue Tear——Burlington Mills
(b) ASTM Trapezoid Tear——Burlington Mills
(c) ASTM Tensile Test —— Mooresville Mills
(d) ASTM Elongation at Break —— Mooresville Mills
(e) Elmendorf Tear Tes:——Mooresville Mills
(f) An Impact or Ballistic Tongue Tear ——U S Rubber Co
(g) Mullen Burst Test on Wounded Sample——U S Rubber Co

Following the luncheon a discussion of stream pollution was held. Mr Souther outlined various approaches to a cooperative study. It was agreed that Mr Souther should form a separate committee of sectional members interested in this subject. This committee would discuss problems and possibly undertake research projects of universal interest.

There was no further business and the meeting adjourned.

Respectfully submitted,
F K BURR, *Secretary*

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Meeting Reports— UTI Student Chapter

November 29, 1951

AT THE November 29th meeting of the Utica Technical Institute Student Chapter, Harold H Taylor of A D Juilliard Company spoke on "Functions of the American Association of Textile Chemists and Colorists". John Patterson was appointed Chairman of the Program Committee. Following the meeting, guests were taken on a tour of the Institute and refreshments were served.

December 13, 1951

AT THE December 13th meeting, William Hamlin of the Utica Knitting Company spoke on "Determination of Percentage of Fibers in a Blend", and described various tests conducted in a physical and chemical testing laboratory. Coffee and doughnuts were served, and later discussion was led by Mr Hamlin.

Respectfully submitted,
NORMAN R THOMPSON, *Secretary*

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Mid-West Section 1952 Meeting Dates

1952 Meeting Dates and sites for the Mid-West Section will be as follows:

February 16—Hotel Bismarck, Chicago, Ill
April 19—Cincinnati, O
June 14—Lake Lawn Lodge, Delavan, Wis
October 4—Hotel Bismarck, Chicago, Ill

Philadelphia Section——

CONTINUOUS DYEING OF VAT COLORS BY THE PAD-STEAM PROCESS*

ISRAEL REINER
Asst Supt, Millville Mfg Co, Millville, N J

Israel Reiner

A textile chemist whose experience antedates the dyeing of cotton piece goods with vat colors reminisces upon the historical developments in vat dyeing as he witnessed them at the Millville Manufacturing Company. He describes early straight jig dyeing, pigment-pad jig-reduction methods and the precursor of present continuous methods; namely, padding with reduced vat dye and reduction in a 1200-gallon booster box. The last method, which constituted an important milestone in continuous dyeing in spite of several shortcomings, was superseded primarily because too much dye and chemical was wasted in changing shades.

The Millville Manufacturing Company was one of the first to adopt pad-steam continuous vat-dyeing as promoted by du Pont. The Author gives a general description of the equipment, of the procedure and of the four variations in the method. These arise from drying or not drying the padded goods and from the use of either dispersed vat pigment or dispersed vat-leuco acid. A typical formula for the preparation of a vat-acid dispersion is given by the author inasmuch as by its use the best dyeings are obtained.

The discussion period was conducted as a symposium with four experts who answered many interesting questions.

INTRODUCTION

IN PRESENTING our subject for this evening, "Continuous Dyeing of Vat Colors by the Pad-Steam Process", it may be well, with your permission, to review cotton dyeing briefly as we knew it before the development of continuous methods.

REMINISCENCE——I first entered the field of cotton piece dyeing at Millville in 1916. As I had recently graduated from college with a degree in chemistry, an industrial laboratory presented a very attractive picture. Hundreds of samples of dyestuffs, in addition to chemicals and files of dyed samples, were truly impressive. The dyehouse itself was a fascinating picture.

At that time we dyed wood colors as well as those direct and basic dyes that were then available. As you know, vat colors had made their appearance, but were used only in a restricted manner. The 1st World War was in progress and then, with our entry into it, all foreign sources of supply were suspended.

Then came our domestic products and the problems attendant upon their use. However, through the efforts of American research chemists and engineers, a complete range of all classes of domestic dyestuffs is now available to us.

EARLY VAT DYEING——After the end of hostilities the demand for faster colors required the adoption of vat colors. After testing hundreds of samples in the laboratory and becoming more and more familiar with their properties, we felt prepared to do commercial dyeing. I admit we approached it with timidity and trepidation. Our first order was 5000 yards of a bright orange shade on a sateen. The method was straight jig reduced with Orange G paste. We added the caustic soda and hydrosulfite, ran six ends, washed, oxidized with chrome and acetic acid, soaped off, and dried up the goods. They looked all right. We thought that wasn't too difficult, but it must have been beginner's luck, as we later found out. However, after many difficulties and heartaches, we overcame our problems.

PIGMENT-PADDING METHODS——The next step in vat dyeing was to pigment-pad and jig-reduce. This method was a great improvement over the straight jig-reduced method, producing more level dyeing, better penetration, and faster colors.

In an effort to speed up production and obtain more uniform dyeing, we then installed a continuous dyeing machine of the booster type. This installation consisted of a pad box, into which was fed reduced dye, and a booster box with a volume of about 1200 gallons containing caustic soda, hydrosulfite, and pad liquor. When proper equilibrium has been reached, long runs of good uniformity were obtained. However, as you can readily see, this method was economical for *only* long runs since the change of large volumes of booster liquors was not feasible for short runs. For small lots, therefore, we reverted chiefly to the pigment-pad jig-reduction method.

PAD-STEAM DYEING

When we were approached by the Du-Pont Company with their continuous pad-steam method for dyeing vat colors, I fear we greeted them with a feeling of horror and consternation. After we had installed thermostatic recording instruments on all our jigs for accurate temperature control, to be told about reduction of all vat dyes at 212°F seemed like heresy. After a visit to their laboratory for a demonstration, we were soon convinced and installed a unit in our plant; after several years we installed another. Our installations are comprised of a 2-bowl pigment padder, a 3-bowl chemical padder, steamer and open soaper, followed by dry cans.

PAD-STEAM METHODS——We employ four variations of dyeing in connection with the steamer:

1) Pad with vat acid, dry, steam.
2) Pigment-pad, dry, steam.
3) Pad with vat acid, leave wet, steam.
4) Pigment-pad, leave wet, steam.

USE OF VAT ACID—Dyeing by the vat-acid method, either wet or dry, has definite advantages. It produces more level coverage of neps, slubs, and other weave imperfections, and, because the particles are finer, the vat-acid method gives better penetration than pigment padding. It has the disadvantage, however, of being limited to lighter shades, that is, to concentrations in most cases of 4 oz of double vat paste per gallon.

The preparation of a vat-acid mix is as follows:

220-Gallon Mix

1) Heat 40 gallons of water to 120°F.
2) Add 10 lb Blancol Conc Pdr previously dissolved.

* Presented in Philadelphia before the Philadelphia Section on September 14, 1951.

3) Add 11 pints of liquid caustic soda, 50%.
4) Add dye.
5) Add 5 lb of hydrosulfite slowly while stirring. Let reduce for 15 minutes at 120°F with occasional stirring.
6) Strain into a large tank containing 140 gal of water @ 120°F to which has been previously added 4 lb Blancol Conc Pdr previously dissolved in water and 4 gal of acetic acid, 56%. This bath should show a pH value of 4.5 to 5.
7) After straining all reduced dye into the tank, add 1 lb Product BCO, 5 lb Superclear 100 and 1 lb hydrosulfite.

Bring bath to a total volume of 220 gal @ 120°F.

Blancol Conc Pdr is used at a final concentration of 1 oz and Superclear at ¼ to ½ oz per gal of total volume.

It might be mentioned that the small tank for the reduction is installed on a platform higher than the large tank to permit straining by gravity.

When cloth is processed by the vat-acid, dry, steam method, it is impregnated on a hydraulic padder and dried immediately after. The use of low-pressure steam on the first stack of dry cans, as well as the use of a Red Ray gas-burner unit on the cloth before it goes over the dry cans reduces migration, blistering of the cloth, and the accumulation of dye on the cans.

The dried cloth is taken to the steamer unit and padded through a solution of caustic soda and hydrosulfite at a concentration 4 oz of each per gallon at 90-100°F with a 4% addition of pad liquor to prevent tapering. This is followed by a 15-second steaming, washing, neutralization with CO_2 and soaping.

The pigment-pad, dry, steam method is similar to the above in application with the exception that only a dispersing agent, such as Superclear, is used with the dyestuff, and the padding is carried out at 160°F. By this method much darker shades with good uniformity, levelness, and fastness are obtained.

One distinct advantage of the method in which the padded goods are dried before steaming is that many lots, large or small, may be accumulated and stored for later steaming. They can then be grouped according to depth and shade in such a way as to reduce the time required for cleaning and to avoid the likelihood of spots from frequent color changes.

From the standpoint of economy of operation, it is desirable not to dry the goods after they are padded with vat acid or pigment before the steaming.

In the case of the vat-acid, wet method, the pad liquor is prepared as before. The goods are impregnated on the 2-bowl padder, passed directly into the 3-bowl chemical pad containing a solution of 5 oz of caustic soda and 4 oz of hydrosulfite per gallon, steamed, and finished off as before.

In the case of the pigment, wet method, the cloth is impregnated first with a suspension of dye containing a dispersing agent and 7 oz of caustic soda per gallon. The squeezed but wet goods are then passed through the chemical pad containing reducing agent and some caustic soda and finally steamed.

In each case, sufficient pad liquor is added to the chemical solution to maintain equilibrium. It has been found necessary also to overflow the pad box somewhat at the chemical pad to keep the bath fresh. We have dyed considerable yardage by this method on shades such as OD3 and OD20.

Each of the four procedures has its advantages, and in determining which method shall be used it is necessary to take into consideration the type of cloth, depth of shade, and their adaptability to the process.

AN AVOIDABLE DISADVANTAGE—There is one very important factor to remember in connection with the steaming method, "Whatever goes in comes out." If the cloth is not perfectly padded, if there are streaks or stains they will come out that way. Herein lies one disadvantage as compared with the pad-jig method, in which the running back and forth often levels off streakedness and eliminates stains. The steamer will not do this.

PREPARATION OF GOODS FOR DYEING—As all dyers know, the condition of the cloth has a great influence on the finished dyeing job. It is of utmost importance that the cloth be properly prepared. Practically all of our cloth is processed in rope form. Our usual procedure is to singe through a detergent, to plait down in rope form, and to bleach on a continuous unit. Mercerized goods are bleached after mercerizing. Bleaching is carried out on a Becco unit. Oxfords and poplins are desized in the grey in open width for the avoidance of rope streaks. Incidentally, the steamer is an excellent machine for desizing as then the cloth is sufficiently softened to obviate rope marks in subsequent operations. It is our experience in the preparation of goods for dyeing that residues of chemicals remaining in the cloth after bleaching have a detrimental effect on dyeing.

CLEANING BETWEEN RUNS—One of our most serious problems in continuous dyeing by the pad-steam process, the only continuous method with which we have had experience, is the time involved in cleaning between shades. In spite of the fact that one of our steamers is stainless steel throughout, our cleaning time is considerable. For the cleaning of stainless steel cans we use a solution of Oakite 36, and for rubber rollers, Lava soap.

SYMPOSIUM

Panel

PAUL L SPEAKMAN, E I du Pont de Nemours & Co, Inc
JOHN W WILSON, Delta Company
FRANK B LUTZ, Millville Mfg Co
ISRAEL REINER, Millville Mfg Co

Question: What is the maximum concentration of dyestuff applied by the pad-steam continuous dyeing process?

Speakman: The maximum concentration that we consider for pad-steam application is anywhere from 32 to 40 oz per gallon. That is strictly for pad-steam application, and not for any other type of application; that also means that this is 32 oz per gallon of a single vat paste, or one-half that amount of double paste.

Q: How does the vat-acid method compare with the straight pigment-pad method for penetration?

Lutz: The vat-acid method gives much better penetration than the straight pigment-pad. This is because, in the vat-acid process, the dye is in a much finer state of division. It is in a colloidal or near collodial state as a vat acid and is naturally much more able to penetrate into the fibers of the cloth than when the color is merely ground, even though it is ground to a very fine degree.

Q: How does the molten-metal process compare with the pad-steam method?

Wilson: I think the principal comparison is that with the molten-metal method you have an opportunity to change rapidly from one shade to another for short runs, and that is particularly advantageous with light colors, but the disadvantage, compared wtih the normal pad-steam process, is the lack of color value. The color value is possibly 20 per cent less with the molten-metal process than with pad-steam.

Q: What is the shortest steaming practical in the vat-steam process?

Lutz: The shortest steaming time is usually about 12 seconds. At the Millville Manufacturing Company we usually run 15 to 16 seconds. I think the average run is between 12 and 18. There

is very little advantage in going over 30 seconds, and I don't know under what conditions 30 seconds is actually required. There are some dyestuffs, particularly the thio-indigos, which should not be steamed as long as 30 seconds because they would be subject to decomposition at that temperature.

Q: Is it necessary to treat the water used for the vat-steam process?

Reiner: I would say it is, if your water isn't satisfactory. In Millville, fortunately, we have water that is suitable for dyeing without any chemical treatment, but I don't know about you folks in the outlying districts. Maybe you do have to use some chemical treatment.

Q: What uniformity between rayon and cotton do you obtain?

Speakman: With the pad-steam method of application, we obtain quite a uniform dyeing with vat colors between cotton and rayon.

Q: How long does it take to clean the steamer?

Speakman: That depends entirely upon the depth of shade.

Q: Did you originally have any condensation problem and spotting?

Speakman: Definitely.

Reiner: The fact is that we have all probably had trouble with spotting. Of course, you have to arrange your equipment so that it will overcome the difficulty, but even then we have not been wholly successful, in spite of watchfulness.

Cleaning up after a run is also a problem and takes considerable time, especially from dark shades to light. Dry cans, padders, and steam rolls all must be cleaned, and when the heat is on the steamer, you just have to wait until it cools so someone can get in there and do it.

Speakman: As far as condensation is concerned, there are different ways of handling the problem. If you have the proper type of throat on your steamer, you do not have too much condensation, but if you don't, then you are in difficulty.

Q: Do you dye any all-acetate fabrics?

Speakman: Vat colors have been applied on all-acetate materials, but not acetate dyes by simple steaming. By running the goods intermittently through a liquid phase inside the steamer, however, acetate dyes may be applied quite well by the pad-steam method.

Q: What do you use in oxidizing vat colors?

Reiner: We do not use any oxidizing agent for the light to medium shades applied by the pad-steam process. We do use carbon dioxide, however, to neutralize the caustic soda. We feed the carbon dioxide at a rate of 20 pounds per hour into the second and third box of a seven-box Rodney Hunt washer.

Wilson: In other words, you do not use any oxidizing agent such as peroxide or chrome?

Reiner: No, we don't, only on special occasions. I mean, you would have to use it for darker shades, but the shades on the steamer are not heavy.

Wilson: On heavy goods, you would use an oxidizing agent?

Reiner: No, we don't.

Wilson: We had been using chrome for some time and use peroxide at the present time. I thought possibly you were using some oxidizing agent like Textone or peroxide, depending on the material you were dyeing.

Wilson: Inasmuch as you don't use an oxidizing agent, how do you find uniformity after the cloth is shaded?

Reiner: Not too bad.

Wilson: What is the particular weight of goods you run?

Reiner: We call our average 4 yards per pound. Although we do run both heavier and lighter materials, some being as heavy as 2 2/3 yards per pound (6-ounce goods).

Speakman: On 6- or 8-oz material, one must use chemical oxidation to get a good result. With lighter materials, satisfactory oxidation can be effected without oxidizing agent.

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Membership Applications

SENIOR

Harry Berman—gen mgr, United Dyeing & Finishing Co, Inc, Catasauqua, Pa. Sponsors: W G Hamlin, R A Shimp.

Leif G Blomquist—sr chem, Text Colors Div, Interchemical Corp, Hawthorne, N J. Sponsors: S Lee, H A Wells.

Sarah M Browning—asst prof of textiles, Univ of Alabama, University, Ala. Sponsors: S J Davis, A McCamy.

Germano Centola—Dir, Stazione Sperimentale Cellulosa, Carta, Tessili, Milano, Italy. Sponsors: G A Slowinske, J E Smith.

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William A Corry—chief, Textile Br, Materials Lab, Wright-Patterson Air Force Base, Dayton, O. Sponsors: G H Schuler, H F Clapham.

Norman Cryer — text technologist, So African Bureau of Standards, Pretoria, South Africa.

Ottilio T D'Al'essio—dyer & sec'y, Palisade Piece Dye Wks, North Bergen, N J. Sponsors: C C Knight, C H Ludders.

Frank H Dudley—text colorist, E I du Pont de Nemours, Inc, Wilmington, Del. Sponsors: C K Black, C A Sylvester.

Theodore W Durand—supt of dye & fin, Regent Knitting Mills, St Jerome, Terre Bonne, Quebec, Canada. Sponsors: G A Wilkie, R W Redston.

Fritz Grether—asst sales mgr, Ciba Ltd, Basle, Switzerland. Sponsors: J P Bauer, G Wiseman.

Adolph Grosswirth—dyer & owner, Reliable Dyeing & Finishing Co, Inc, Paterson, N J. Sponsors: M Grayson, F Grosswirth.

Charles A Hastings—cost & prod, Windsor Print Wks Div, Consolidated Text Co, North Adams, Mass. Sponsors: H Gendreau, R Lindenmaier.

Willie L Hayes — asst dyer, Renfrew Bleachery, Abney Mills Co, Travelers Rest, S C. Sponsors: W L Barker, J O Vernon, Jr.

Carlos Hornstein—asst mgr, Coba S A de Productos Quimicos (Balmes — 117) Barcelona, Spain. Sponsors: W H Kieffer, J P Bauer.

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Webster Rooks—asst to pres, U S Oil Company, Phillipsdale, R I. Sponsors: R K Andrews, T E O'Rourke.

John E Sanders — boss dyer, Holland Manufac Co, Stroudsburg, Pa. Sponsors: J W MacNeil, A H Seitz.

Warren J Schwab—hosiery dyer, Sharon Hosiery Dye & Fin Co, Quakertown, Pa. Sponsors: J W MacNeil, A H Seitz.

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JUNIOR

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Warren A Dickinson, Jr—sales engineer, Proctor & Schwartz Inc, Philadelphia, Pa.

Katherine F Glass — librarian, Callaway Mills Company, Research Div, LaGrange, Ga.

Rodman Hanson—Phila adv mgr, Textile Industries, Atlanta, Ga.

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Richard H Brehm, 3rd—North Carolina State College. Sponsor: H A Rutherford.

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Gilles Filion — St Hyacinthe Textile School. Sponsor: G R Boulé.

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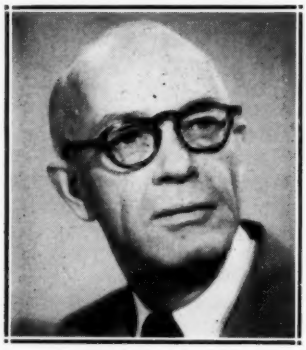

T A Feild, Jr

Feild to Address Southeastern Section on Feb 23

THE next meeting of the Southeastern Section is to be held in Talladega, Alabama, February 23, 1952.

The afternoon technical session will begin at 2:30 pm, in the Alabama Power Company auditorium. The feature of the meeting will be a talk by T A Feild, Jr, of the Research and Development Department of Carbide and Carbon Chemicals Company, on "The Dyeing of Dynel and Related Products". This will be followed by questions and a general discussion.

The evening session will consist of a banquet at the Purefoy Hotel at 6:15 pm, followed by a business session.

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Meeting Report— Philadelphia Section

December 7, 1951
Kugler's Restaurant, Philadelphia, Pa

A MEETING of the Philadelphia Section was held on December 7, 1951 in the English Room of Kugler's Restaurant in Philadelphia.

Herbert C Haller, assistant director of research, Forstmann Woolen Co and Dr James H Wakelin, director of research, Textile Research Institute, presented a paper on the subject "Research Studies and Worsted Processing Trials on Medium and Fine Wools".

124 members and guests attended the dinner and 155, the technical session.

Respectfully submitted,
THOMAS H HART, *Secretary*

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WNE Meeting Dates (1952)

MEETING dates for the Western New England Section during the year 1952 have been set as follows:

January 25: Rapp's Restaurant—Shelton, Conn; March 14: Danbury, Conn; May 2: (Ladies night) Cheshire, Conn; June 20: Outing; October 3: Rapp's; November 14: Rapp's; December 12: Rapp's.

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

Meeting Report— NCSC Student Chapter

November 29, 1951

THE North Carolina State College Student Chapter, at its November 29th meeting, heard O W Clark, Calco Chemical Division, American Cyanamid Company speak on "The Fundamental Principles in the Application of Vat Dyes". Mr Clark was accompanied in his trip to Raleigh by Fred Fordemwalt and J Mecco, also of Calco. Approximately 50 students were in attendance.

Respectfully submitted,
R F MILLER, *Secretary*

Program, 21st Annual Meeting, ISCC

THE provisional program for the 21st Annual Meeting of the Inter-Society Color Council, which will be held February 7-9, 1952 at the Hotel Statler, New York, N Y, has been announced as follows:

Date	*Time*	*Speaker*	*Subject*
February 7	AM	Dr E I Stearns	Introduction
		Procter Thomson	"Color of Oils"
		Faber Birren	"The Functional Approach to Color"
		Dr Arthur C Hardy	"Color Reproduction"
		Dr Peter C Goldmark	"Color in Color Television"
	PM	Dr Deane B Judd	"CIE Meeting in Stockholm"
		Dr W D Wright	"Seeing Color Differences"
		(Dr Wright is Professor of Physics at the Imperial College of Science and Technology, London, England)	
		Ralph M Evans	"Color in Color Photography"
February 8	AM	Dr Harry Helson	"Color Appearance"
		Kenneth C Welch	"Color in Merchandising"
		A H King	"Abstract Movies"
	PM	Gladys Miller	"Right Color-Wrong Answer"
		Dr E I Stearns	"Color in Textiles"
		Dr Martin Fischer	"Artists and Their Colors"
	Eve	Dr I A Balinkin	"Color Phenomena"
February 9	AM	Business Session, including: Reports of technical committees on color problems; Reports from 21 Member Bodies summarizing 1951 color activities	

Among the exhibitors who have space assigned at the meeting are:

American Institute of Architects
American Institute of Decorators
American Oil Chemists Society
American Psychological Association
Federation of Paint & Varnish Production Clubs
Illuminating Engineering Society
Technical Association for the Graphic Arts

ISCC Subcommittee on Problem 2:	Color Names
ISCC Subcommittee on Problem 7:	Color Specifications
ISCC Subcommittee on Problem 10:	Color Aptitude Test
ISCC Subcommittee on Problem 12:	Studies of Illuminating and Viewing Conditions in the Colorimetry of Reflecting Materials
ISCC Subcommittee on Problem 14:	A Study of Transparent Standards Using Single-Number Specification

MEMBERS OF THE AATCC ARE CORDIALLY INVITED TO ATTEND ALL FUNCTIONS OF THE MEETING.

ABSTRACTS

The Uses of Artificial Fibers in Woolens

R R Franck, *J Textile Inst* 42, P873-6, September, 1951.

There are four possible methods of including artificial fibers in woolen cloths: (1) as fiber/fiber mixtures in the yarns, (2) as continuous filament core yarns virtually buried in the wool, (3) as separate ends and picks in the cloth, and (4) as supporting threads.

The first method of introducing artificial fibers into woolens, i e, as fiber/fiber blends, has been well explored, although new effects are constantly being obtained. All the new fibers can be introduced in this manner. When blending wool with these textile materials it is advisable to choose fibers comparable in fineness with those of the wool, or at least not differing too greatly, otherwise trouble will follow during carding and spinning.

If Fibro, Rayolanda or nylon is blended with wool the strength of the yarn produced, compared to the strength of a similar yarn spun from the same quality of pure wool, is greater. For example, each 1 per cent addition of nylon to a wool blend will increase the strength of the yarn by 2.5 to 3 per cent. This means that either the yarn can be finer without decreasing spinning and weaving efficiency, and thus lighter weight cloths can be produced, or the count need not be altered and a stronger and more level yarn will be produced.

Fabrics made from blends of wool and artificial fibers have different felting and shrinking properties from those of fabrics manufactured from pure wool. For example, Vinyon shrinks a great deal when washed, casein fiber shrinks a little more than wool, Ardil shrinks as much, while acetate, viscose and nylon shrink less. It is possible to control the amount of shrinkage during finishing by varying the amount of new fiber in the blend. If 35 per cent of nylon is used the fabric is practically unshrinkable.

A further advantage of these blended fabrics is the increased resistance to abrasion. This is especially true in the case of nylon/wool blends in men's half-hose.

The idea of having a continuous filament yarn of high strength embedded in the wool has much in its favor. For example, if the core yarn is nylon, the compound thread, in theory, should have the strength of the nylon and the handle of the wool. It is, however, difficult to obtain a yarn in which the core is completely covered.

When the artificial fibers are included as separate ends and picks in the cloth, many possibilities arise. If these fabrics, containing two or more types of yarn, are cross-dyed, all the usual color and weave effects, stripes, checks, etc, can be produced without going to the trouble and expense of keeping stocks of colored yarns.

Another kind of novelty fabric can be obtained by including in the cloth yarns such as Vinyon, which shrink during finishing. On contracting, the Vinyon causes the wool to buckle and thus give a bouclé effect.

The fourth method of introducing artificial fibers, as supporting threads, has also been used in novelty fabrics, the best known case being that of alginate which has the rather unusual property of being soluble in ordinary scouring solutions. The alginate yarns are twisted with woolen or worsted yarns of very fine count, too weak to weave satisfactorily. When the alginate is dissolved, a very light-weight and soft cloth remains.—WHC

A Survey of Textile Resins

J S Trevor, *Textile Recorder* 69, 93-4, September, 1951.

One of the most important developments in textile finishing during the last decade has been the use of synthetic resins to produce marked changes in the properties of fibers and fabrics. With the aid of various polymeric substances the textile manufacturer can produce crease-resistant finishes on spun rayon, rayon blends, and light-weight cotton fabrics, stabilize fabrics against shrinkage or stretch, produce water-repellent finishes, reduce the swelling of rayon and improve its wet strength, give glazed chintz finishes to cotton and rayon fabrics, improve the fastness of certain direct cotton colors, and achieve a so-called "animalizing" of cellulose fibers, improving warmth, handle, etc.

Both thermosetting and thermoplastic resins are used for textile finishing, each type finding its own particular sphere of usefulness. In general, the thermoplastics are inherently more flexible and durable and do not require curing, as the resinous constituents are present in the fully polymerized form. They are essentially film-forming products and the resin is deposited on the fiber which itself remains unchanged. Normal drying at 200-240°F is sufficient to cause evaporation of the water present in the resin dispersion and deposition of the resin.

The thermosetting resins tend to be more versatile in their applications, and some of them bring about a chemical change in the fiber, modifying its properties to a remarkable extent. They are usually supplied in two forms, monomeric and partially polymerized, curing or completion of polymerization being brought about by processing the fabric in the resinous solution in the presence of an acid- or acid latent catalyst, and later subjecting the dried material to a relatively high temperature for a short period of time.

Of the thermosetting products, probably the best-known for textile purposes are the urea and melamine condensates, which are water-soluble and, on polymerization, give highly resistant, glass-clear, insoluble resins. The well-known anti-crease finish is based on these resins.

Both melamine and urea condensates are used extensively as shrinkage control finishes on rayon and cotton goods and also for the stabilization of the fibers in sheer woven fabrics. Melamine-formaldehyde preparations are also employed for the shrinkage control of woven or knitted wool, and treated fabrics show a high resistance to shrinkage and felting.

An interesting development is the combination of shrinkproofing and mothproofing, by mixing water-soluble alkylated methylomelamines with melamine fluosilicate or fluoborate.

Waterproofing of fabrics can be achieved by use of certain melamine formaldehyde resins, e g, a hydrophobic water-insoluble melamine formaldehyde ether dispersed in water and used with a special accelerator and ammonium hydroxide to give a pH value of 8. It is also possible to combine the effect of the modified melamine formaldehyde resin with a urea-formaldehyde resin in one bath so as to produce a fair degree of water-repellency with good wrinkle resistance.

Other thermoplastic resins referred to briefly are the Acrisins, developed in Germany for reducing the swelling and shrinkage of rayon; N-octadecyl-N-ethyleneurea, a permanent water-repellent, sold by I G Farben as "Persistol VS"; certain organosilicon compounds, used for fireproofing, antislip, etc; and "Quilon", a stearato chromic chloride, used for water-repellency.

Turning now to the thermoplastics, it is the acrylics which are possibly of the greatest interest. Nonionic emulsions of these products are now available, which are sufficiently stable to permit incorporation of various gums. Moreover, owing to their nonionic character they can safely be combined with cationic or anionic substances (e g, cationic softeners).

The acrylic emulsions are particularly valuable for coating purposes, giving durable and flexible finishes——in other words, a permanent starched effect on cotton and rayon fabrics.

Vinyl resins, usually copolymers consisting of 93 per cent chloride and 7 per cent acetate, were extensively used in the last war for the treatment of cotton fabrics, to confer chemical stability, flex and low temperature and weather resistance, and also as an adhesive to bond layers of textiles.

Polystyrene is assuming some importance as a flexible protective coating agent, and certain polyamides are proving of interest for the treatment of fabrics so as to increase their resistance to dirt and grease. —WHC

Scouring Nylon Fabrics

Anon, *Textile Mfr* 77, 510-11, October, 1951. (From "Technical Service Manual" of British Nylon Spinners Ltd)

The scouring or boiling-off of materials made from nylon, as in the case of other fibers, is primarily for the purpose of removing the size and oils put on the yarn to facilitate weaving and knitting, and also to remove any grease or other contamination accumulated on the fabric during the mill processing operations.

Certain types of grease, oil and other contaminants, especially when accompanied by graphite or metal dust, are difficult to remove from nylon yarn of fabric. Such dirt particles attach themselves firmly to the fiber surface and occasionally resist all attempts to remove them. This is particularly the case when scouring takes place after a setting operation, since in all instances setting intensifies the problem of removal of dirt.

When fabric is badly stained it is advisable to use spotting and cleaning agents prior to setting and scouring. When there is heavy contamination consisting principally of grease and oils, solvent action combined with detergent action is needed.

In adopting a scouring procedure, due regard should be paid to the question of setting. In many fabrics, specifications for permanency of set or minimum shrinkage are involved.

In some cases, especially where the unset fabric contains amounts of dirt and grease, scouring of the fabric before setting is necessary. This prevents the dirt from being set more firmly into the fiber by the setting conditions. Provided that the temperature of this preliminary scour is kept low, at about 120°F, undue shrinkage does not occur.

Almost any standard boil-off with materials such as soaps, synthetic detergents together with a small quantity of trisodium phosphate, sodium hexametaphosphate and sodium metasilicate is sufficient to accomplish the scouring of nylon.

The scouring may be conducted in various ways. The usual scouring equipment is used, the precise method adopted depending upon the nature of the fabric and whether the fabric has been set. The following suggestions are made to serve as a guide, and to be modified according to the equipment and procedure of each individual mill:

(a) Boil-off or scour on a jig. No presetting is necessary for the prevention of permanent wrinkles.

(b) Boil-off or scour on a continuous boil-off machine. It may be advisable to carry out this operation at low temperature (120-140°F) unless the fabric has been adequately preset.

(c) Boil-off in book or skein form. This creates relatively little tension and allows maximum shrinkage to take place.

(d) Boil-off in star form. This also allows maximum shrinkage to take place.

(e) Rope boil-off or scour on a winch. This method requires presetting the fabric to prevent wrinkles. Lightweight woven fabrics and particularly warp-knit fabrics are amenable to this treatment.

Generally speaking, a scouring treatment should be given after setting, irrespective of any previous scour, in order to improve the handle and enhance the draping and other desirable characteristics of the correctly-set material.—WHC

Causes of Unlevel Dyeing of Cotton Cellulose. The Influence of Mercerizing and Bleaching Processes on the Fine Structure of Cellulose.

I Gailey, *J Soc Dyers Colourists* 67, 357-61, October, 1951.

Unlevelness in dyeing is a feature that is met all too frequently in the dyehouse, and it has been and is the custom to blame the dyer. The author tries to show, however, that in many instances the dyer is merely suffering the consequences of faults that have arisen in preceding processes.

Variations in the cotton substrate causing unlevelness can be divided into four main classes:

A. Presence of impurities in cotton. These impurities can be classified as follows:

(i) Substances which are inert and which act as a barrier obstructing normal contact between cellulose and dye (e g, oils, waxes, etc).

(ii) Substances that are chemically active and that preferentially absorb or repel dyes (e g, pectic matter and size).

(iii) Substances that exert no effect (e g, cotton wax).

B. Variations in sorptive capacity caused by chemical modifications of cellulose, e g, oxycellulose and hydrocellulose. These modified forms of cellulose behave in a similar manner to substances listed above in A (ii).

C. Optical effects.

D. Variations in the sorptive capacity of cotton arising from differences in the fine structure of cellulose.

The major portion of the paper is confined to consideration of those factors that alter the availability of hydroxyl groups in the macromolecular cellulose structure, which determines the dyeing properties.

Contrary to older ideas, cellulose is fairly reactive and readily undergoes change. If a change takes place in an uncontrolled manner, irregular sorption is often the result.

Treatment of cotton fibers with strong sodium hydroxide solution brings about several changes. The proportion of amorphous cellulose is increased, the degree of orientation is decreased (if the cotton is allowed to shrink freely) and the crystal lattice is altered. The net effect of these alterations in fine structure is the well-known increase in sorptive capacity. The increase in amorphous cellulose can be detected in X-ray photographs, and the results reported in the literature indicate that the amorphous content is increased from 30 to 50 per cent on mercerization.

In a commercial mercerizing process the strong sodium hydroxide is washed out of the cotton with hot water, and it has been found that the temperature of wash affects the sorptive capacity of the product. It is obvious that attention must be paid to regularity of temperature of wash after mercerizing, otherwise variation in the sorptive capacity and consequent unlevel dyeing may result.

Kier boiling causes a reduction in the sorptive capacity of cellulose of approximately 7 per cent in the case of unmercerized cotton, and of approximately 8 to 10 per cent in the case of mercerized cotton. This effect of kier boiling is of practical and theoretical interest. From the practical point of view, it is essential that the extent of the change in sorptive capacity is regular through a bleaching lot, otherwise irregularity on dyeing may result.

It has been known for a long time that drying reduces the sorptive capacity of both mercerized and unmercerized cotton. Irregular drying, particularly above 80°C, leads to differences in sorptive capacity, and such differences give rise to unlevel dyeing.

Twenty-six references to the literature are given.—WHC

Dyeing Polyvinyl Chloride Textiles

Anon, *Dyer* 106, 545-9, October 19, 1951.

The pure polyvinyl chloride fibers made in France by Société Rhovyl and sold on the English market may be divided into two groups, as far as dyeing and finishing are concerned:

1. The thermally stabilized fibers, sold under the trade-mark Thermovyl.

2. The fibers which have not been stabilized thermally, sold under the trade-mark Fibravyl.

The continuous filament Rhovyl belongs to the second category.

If one wishes to dye fabrics entirely or partially composed of Rhovyl or Fibravyl and at the same time to preserve their dimensional characteristics, one must choose methods of treatment, including final drying, which permit the desired objects to be achieved without submitting to goods under treatment to the temperatures at which shrinkage will occur, that is, about 72°C. On the other hand, goods made of Thermovyl suffer infinitely less shrinkage between 75° and 100°C, and can be treated at temperatures in the neighborhood of 100°.

The author gives instructions for scouring and desizing these various fibers, keeping the temperature low enough to avoid shrinkage.

Thermovyl fibers are dyed with selected dispersed acetate dyes at 95° C. This form of dyeing does not present any difficulty, and one can obtain deep shades as well as light ones. Certain acetate colors on Thermovyl have exceptional fastness to wetting, greatly superior to that on other fibers.

Naphthol colors may be produced by applying a dispersion of fast color base and Naphthol at 80-90° C, and later developing the color with nitrous acid.

Fibravyl and Rhovyl fibers may be dyed only in light shades with acetate dyes at the permissible temperature. It is necessary to use an assistant which increases the affinity of the fiber for the dyes.

Selected Indigosol dyes may also be applied to these fibers. Dyeing is conducted at 60° C with the addition of Glauber's salt and ammonium sulfate, and the dye is oxidized with nitrous acid. —WHC

Recent Developments in Fluorescent Lamps, with Particular Reference to Color Problems

S T Henderson, *J Soc Dyers Colourists* 67, 362-7, October, 1951.

The author explains that the low-pressure fluorescent lamp is essentially an arc in mercury vapor between electrodes, which may be of the "cold" type using high-voltage supply, or "hot" as in the mains-voltage lamp. A rare-gas filling, (usually argon), permits easy starting, but in normal running the mercury arc alone is seen, and the resonance radiation at 2537 Å in this arc is the chief exciting agent for the fluorescent powder on the lamp walls.

The phosphors used in fluorescent lamps are inorganic solids, very often including a Group II metal as their main metallic ion, with anions which vary very widely. Thus there are silicates, tungstates, phosphates, borates, arsenates, germanates, titanates, etc, and like the naturally occurring minerals these synthetic phosphors are often nonstoichiometric in composition. Phosphors have, in most cases, an essential ingredient known as the activator, which is usually a foreign heavy metal present to the extent of, say, 0.01-5 per cent, and without which the characteristic fluorescence is not developed. These activators have to be incorporated by heat treatment; they include a great variety of metals, but manganese is preeminent for the phosphors under consideration.

The property of the phosphors with which this paper is mainly concerned is their spectral emission. Speaking generally, all of them exhibit wide, structureless bands which may lie in almost any part of the visible spectrum, and occasionally in the ultraviolet or infrared. The lamp technologist produces his different colors by mixing phosphors, and with the wide variety at hand an immense number of combined emission curves can be obtained. One fact has to be remembered, namely, the invariable presence of the mercury spectrum in the emitted light, in addition to the phosphor bands.

The author discusses spectral emission curves and color specifications, and the varied and often conflicting ideas which make up the subject of "color." Finally, he comes to the "urgent but difficult matter of color rendering", and shows what is required and what is being attempted (e g, the production of a satisfactory substitute for north skylight for color-matching). He describes particularly the attempts being made to overcome the deficiency in red at the long-wavelength end of the spectrum.—WHC

Dyeing Polyester Fiber with Acetate Dyestuffs

D G Carmichael, *Textile Age* 15, 32-5, December, 1951.

Dacron polyester fiber resembles somewhat the polyamide fiber nylon, having high tensile strength, setting properties, low water absorption, and chemical and microorganism resistance. Polyester fibers differ in having higher resistance to deterioration by light and higher tensile strength, specific gravity, refractive index and initial modulus of elasticity. The polyester fibers are less soluble in the more active types of solvents than the polyamide fibers. The low water absorption (less than 1 per cent) and high resistance to chemicals, desirable properties in many respects, are drawbacks and present difficulties in dyeing these fibers.

Polyester fiber, like acetate rayon fiber, may be considered as a solid organic solvent, receptive to colored substances that are free from water-solubilizing groups, such as dispersed acetate dyestuffs. These have shown the most affinity for Dacron. A greater tinctorial value can be most satisfactorily effected by increasing the rate of diffusion with dyeing assistants and maintaining a temperature betwen 200° and 212° F. At lower temperatures Dacron will dye much more slowly than nylon; at higher temperatures, much more rapidly.

The effectiveness of a dyeing assistant (so-called "carrier") is not dependent on its swelling efficiency; some carriers exert relatively little, if any, swelling action on the fiber being dyed. It has been suggested that these substances may be capable of opening the noncrystalline regions of the fiber so that the dye molecules may enter.

The author lists a large number of substances that have been tried as dyeing assistants for dispersed acetate dyes. He states that the best results were obtained with monochlorobenzene, o-dichlorobenzene, and tetrahydronaphthalene. A typical carrier is prepared as follows:

75 parts of tetrahydronaphthalene
5 parts of cyclohexanol
20 parts of nonionic or anionic emulsifying agent.

100 parts.

The fabric is first scoured with tetrasodium pyrophosphate. The dispersed dye is added to the dyebath at 90° F with 8 per cent of the carrier, previously emulsified in warm water. Dyeing is conducted at 205-212° F.

Fastness ratings of a number of acetate dyes applied by this method are included. —WHC

The Dyeing of Wool-Nylon

R Wittwer, *Ciba Rev* 88, 3193-6, October, 1951.

Special care should be taken during the cleansing of wool materials containing nylon. Owing to the fact that nylon has the power to dissolve fats, and that these fats are extremely difficult to remove, the usual washing is insufficient in many cases if the goods are badly soiled. In such cases the author recommends washing for one hour at 120-140°F with 2 per cent of tetrasodium pyrophosphate and 1 lb/gal of

Ultravon W.

When mixtures of wool and nylon are dyed, the nylon fiber is dyed deeper in pale shades and the wool fiber, deeper in full shades. Where medium shades are concerned, a balance may often be obtained by adding a colorless textile chemical having affinity for the nylon fiber.

If the wool is to be left white, the nylon is dyed with acetate dyes and the wool is afterwards cleared with hydrosulfite or potassium permanganate.

The writer knows of no process by means of which the nylon may be left white, but states that it may be reserved to a certain extent by using carefully selected wool dyes and pretreating the fabric with Invadine BL. A list of the most suitable acid, premetallized, and chrome dyes for this purpose is included.

The Neolan-type dyes offer the simplest and surest method of producing solid shades on wool-nylon mixtures of excellent levelness and outstanding all-around fastness properties. Not all the colors of the Neolan range, however, are equally suitable for dyeing nylon. The dyeing of the mixed fibers follows very nearly the same principle as for pure wool. The Neolan dyes show the greatest affinity for nylon when applied at the boil, so that loss of heat during dyeing should be avoided.

The field of application of the acid wool dyes which are applied from an acid bath is much more limited than that of the Neolans. The reason for this is to be found in the greatly varying rates of exhaustion of the individual types. The writer recommends several acid dyes which possess similar dyeing properties and are suitable for combinations.

Some of the neutral-dyeing acid dyes have been found suitable for dyeing solid shades on wool-nylon mixtures. A list of these dyes is included.

The article concludes with a recommendation of certain after-chromed dyes which are suitable for this work.—WHC

"True Blue"

L P Rendell, *Textile J Australia* 26, 708, September, 1951.

Many of us in our youth have read in our history books that when Julius Caesar first landed in Britain he found there a race of half-naked savages who covered their bodies with a blue pigment obtained from the Woad plant. This pigment, the author reminds us, is chemically the same as Indigo.

Woad was widely used in Britain in the Middle Ages for the dyeing of wool materials, and was much esteemed on account of the fastness of the blue shade obtained, but was gradually displaced by Indigo imported from the East Indies. It finally became obsolete as a dye, but continued to be used in conjunction with Indigo as a component of the "fermentation" vat.

At the beginning of the present century, Indigo obtained from the plant in turn was superseded by the synthetic product, which is in fact chemically identical but purer and more uniform in strength.

Navy blues dyed with Woad were classified some centuries ago as "true" blues, as against the "mock" or "false" blues dyed with Logwood, for example, and it is from this that the expression "true blue" has been adopted in the English language to describe a person of integrity, or a genuine article.

The question of whether bottoming with Indigo is worthwhile prior to topping with some other dye is often asked. The writer has no doubt on this score. Fast as many of the modern navy blue dyes are to light and atmospheric conditions, there is none which cannot be improved in shade and fastness in wear by the presence of a good "bottom" of Indigo on the cloth. Admittedly an extra process is involved with attendant added cost. The modern tendency of taking the easy way and avoiding extra trouble may cause a decline in the use of Indigo for worsted coatings, but nevertheless this dye still remains "true blue".—WHC

Properties and Possibilities of Present Synthetic Fibers

J A Davis, *Canadian Textile J 68*, 60-2, November 9, 1951.

The author first reviews the development and rapid expansion of the synthetic fiber industry and the methods of manufacture of the various fiber types. He then describes their properties and uses as follows:

The outstanding properties of the commercially available synthetic fibers that have made them attractive are perhaps best illustrated by examples of the end products which utilize their properties.

Viscose rayon has paved the way in the textile market for the other synthetics. Regular continuous filament rayon used in apparel fabrics is outstanding for its dyeability. Brilliant colors with excellent wash and light fastness can be procured, and it is the only synthetic fiber which can make a true crepe fabric. These properties combined with its good drape and pleasing hand have contributed to its success in the women's dress field; 60 per cent of the total fiber used in this market are rayons.

The use of high-tenacity rayon in the manufacture of tires has resulted because of its strength, resistance to bruises, resistance to high temperatures, and low cost.

In the staple form, viscose rayon, generally combined with other fibers, is now the leader in suitings for summer wear. The development of blends and fabric finishes has permitted production of a tropical-type suiting which is becoming increasingly popular because of its comfort, style, and low price.

Acetate differs from viscose in that it is less water-absorbent, dyes with different classes of dyestuffs, and possesses good wrinkle resistance. The soft luxurious hand of the fabric has accounted in a large measure for the success of this type fiber in dress goods, lingerie, and lining fabrics. A high-strength saponified cellulose acetate yarn called "Fortisan" has also been developed and has been utilized for military purposes. Acetate staple is primarily used blended with viscose staple in the manufacture of suiting materials.

Nylon, the first of the truly synthetic fibers, started a revolution in the textile world that is still continuing. The outstanding properties of this fiber are its recovery from stretch, abrasion resistance and high fatigue life. Nylon, like many other materials, went to war, where it was used in the production of parachutes, aeroplane tires, glider tow ropes, and many other items. The use of nylon yarn in ladies' hosiery is well-known to everyone.

Nylon fish nets are said to catch more fish than the regular cotton or linen type. Nylon twines used in net manufacture are considerably finer and do not require bacteriological treatment which tend to make other nets more visible in water. Other advantages of nylon nets are that they are lighter, do not absorb as much water, and may be stored wet.

Nylon filament yarn shirts have good appearance, launder easily, dry quickly, and require little or no ironing. These same easy-living characteristics as well as its good durability have made nylon first choice for ladies' lingerie. In the staple fiber field men's socks of nylon have considerable merit; they wear well and are easily laundered.

Orlon acrylic fiber is outstanding for its resistance to sunlight, weather, high temperatures, and for its very high bulk. Window curtains made from Orlon have excellent drape, dry quickly, and are stable to acid fume conditions and sunlight. Tests comparing Orlon with other fibers indicate that under light and weather exposure Orlon retains 80 per cent of its original strength when other organic fibers have disintegrated. Suitings and overcoatings made from Orlon staple fiber have good appearance, good resilience, and excellent potential for the suitings required in our winter climate.

The polyester fibers, Terylene and Dacron, possess many good characteristics and are outstanding because of high resistance to stretch and high resilience both wet and dry. The most natural outlet for these

fibers appears to be in suitings and all types of outerwear. The reason that wool makes such good suiting material is because of its high resilience. However, there is a fundamental difference between the resilience of wool and the polyester fiber, as the latter maintains its high resilience in all moisture and weather conditions. In addition, due to its thermoplastic nature it has excellent press retention under wet as well as dry conditions, and, after drying, a polyester fiber suit looks just as it did before it became wet. It should be noted that the high strength of this fiber makes fabrics of lighter weight practical.

The author predicts that chemists with their ability to synthesize new materials will make possible more spectacular fibers whose properties will be tailor-made for specific applications.—WHC

Book Reviews

PAINT AND VARNISH PRODUCTION MANUAL

Verne C Bidlack and Edgar W Fasig
John Wiley & Sons, Inc
440 Fourth Ave, New York, N Y
288 pages—$6.50

This book, written by two experts in the paint and varnish industry, is a model of its kind. Well and succinctly written, it fulfills the object set forth in the preface "to fill the need for assembling in one volume the basic knowledge of production facilities and methods employed by the paint industry".

While the chapters on paint and varnish manufacturing, engineering, and plant procedure have but little interest to the textile man, the chapters on personnel, factory cost accounting, research development and control, fire protection, safety and health could probably be read with advantage by the chemist, engineer or executive in any branch of industry.

A useful feature of the book is a very complete bibliography at the end of each chapter. The printing is good and the index adequate.—GB

MONOMERS, SECTION II

Edited by E R Blout and H Mark
Interscience Publishers, Inc
250 Fifth Avenue, New York 1, N Y
1951. Six sections. 257 pp. $5.00

The first section of this useful compilation consists of 8 chapters, separately bound and punched and inserted in a loose leaf binder. Section II adds six more chapters entitled: Acrylic Acid, Esters of Acrylic Acid, Esters of Methacrylic Acid Other Than Methyl Methacrylate, Vinyl Ethers, N-Vinylcarbazole, and Vinylpyridine. The first two are by John T Clarke and the others are by Richard S Corley, C E Schildknecht, Kurt C Frisch, and Harry Frisch, respectively.

The entire collection of monomers is stated to be "a collection of data and procedures on the basic materials for the synthesis of fibers, plastics, and rubbers". Each chapter generally has an introduction and sections on preparation or production, purification, analysis, physical and chemical properties, polymerization, and bibliography. It should be noted that the characteristics of the polymers are not given.

As may be expected in a work by several authors, many inconsistencies may be noted in respect to order and thoroughness of treatment and emphasis. For example, spectroscopic data, thoroughly covered for some monomers, is given scanty treatment for others. Perhaps the greatest lack is an adequate discussion, or even an awareness, of the mechanism of polymerization of several of the monomers.

Some chapters seem to have an undue number of errors. While the tricovalent carbon atom on page 7 of *Esters of Acrylic Acid* may be a typographical error, the statement on page 1 of *Vinylpyridine,* that there are four isomers of vinylpyridine, seems to reveal a lack of knowledge of the theory of organic chemistry. On page 5 of this same chapter a hydrogenation is carried out with nitrogen while the resonating structures on page 15 are sheer nonsense. These criticisms should not detract from the usefulness of the series, especially to textile chemists interested in the chemistry of synthetic fibers.—AS

PATENTS FOR TECHNICAL PERSONNEL

Dr Worth Wade
Chemonomics, Inc (1951)
400 Madison Ave, New York, N Y

This handbook should find enthusiastic acceptance into the working library of every technical employee, whatever his rank or responsibilities. Written by a chemist, expert in the field of patent law, who has had broad experience in the patent departments of top-ranking corporations, it is a working *tool* in the soundest interpretation of that term. Compact, stripped of involved legal phraseology, and organized for everyday use, it makes clearly applicable the key points in every phase of patent procedure with which technical personnel may be concerned. One wishes that every field of business law might receive the attention of men with the author's facility in making understandable and usable those legal principles in which the layman soon flounders without legal advice and guidance.—JRR

WATER TREATMENT FOR INDUSTRIAL AND OTHER USES

Eskel Nordell
Reinhold Publishing Corp
330 West 42nd St, New York, N Y
1951. 526 pages. $10.00

The vast amount of data on water treatment in this practical and up-to-date reference book is comprehensively written and carefully correlated by an author who has had thirty-two years experience in the water problems connected with the chemical and process industries. The author's extensive background is evident throughout the 526 pages, which have been subdivided into eighteen compact, fact-filled chapters.

This reference book should become an indispensable addition to every laboratory, inasmuch as the problems of water analysis treatment and conditioning are present in practically all industries. The forthright and simple presentation of basic principles and problems interspersed with numerous graphs, charts, photographs, diagrams, and tabular data, should enable chemists, engineers, consultants, operating personnel and students to find and interpret data which hitherto has been unavailable in compact form.

This is not merely another text book for chemistry students. This reference work represents an exhaustive compilation of data which has been cleverly integrated with the many practical problems encountered by the author throughout his active work in such fields as ceramics, plastics, rubber, dairy, textile, oil and gas, pulp and paper, laundry, and municipal engineering.—EPJ

MICROBIOL DECOMPOSITION OF CELLULOSE

Ralph G H Siu
Reinhold Publishing Corp (1951)
330 West 42nd St, New York, N Y

The author has attempted (and succeeded) in writing the first complete and up-to-date book on microbiol decomposition of cellulose, with special reference to cotton. He has combined the chemistry of cellulosic material with related and general microbiology and has interwoven them coherently, utilizing many significant tables, charts, and pictures.

Every important phase of cellulose and microbiology has been adequately covered. A list of all these important topics covered would require too much space. A brief but fundamental discussion of weaving, wet finishing and dyeing of cotton, a lengthy discussion of the mechanisms of cotton degradation, and much other useful information, together with the field of microbiology and the effect of microorganisms on cellulose, have been amply covered. The sections on microbiology have utilized many fields of data from various parts of the world. The particular section on the methods of testing microbiol resistance of cotton textiles is excellent, explaining the various techniques and methods used, comparing these methods to one another, and introducing a new method of mildew control testing —the manometric technique. By this method the time element is drastically reduced.

The criterion of mildew susceptibility is based on the oxygen absorbed by the microorganisms during growth rather than on changes in the fabric itself. The greater the oxygen consumed by the microorganisms, the more susceptible is the fabric and vice versa. The technique requires the use of a differential manometer, which can, if desired, be self-made since the method is on control testing. Potassium hydroxide is used to absorb the carbon dioxide liberated by the microorganisms.

A most important feature of the book is the extensive bibliographies which alone make the book worthy of a reference.—HB

CROPS IN WAR AND PEACE (The Yearbook of Agriculture 1950-51)

U S Department of Agriculture
c/o Superintendent of Documents
Washington 25, D C
942 pages—$2.50

Two of the eighteen main divisions of this large volume are of primary interest to the textile chemist, namely: "Fibers from Cotton", and "Natural and Man-Made Fibers", comprising over 100 pages of text. These divisions in turn are comprised of several short sections (4-8 pages) pertaining to the division titles, and for the most part are written by scientists working in the various regional research laboratories. These short articles are surveys of recent trends in textile technology, the most interesting of which are probably those devoted to a discussion of cotton finishing and to the future for domestic wool.

Although there is little information of an original nature in this book, it does contain a lot of interesting reading; furthermore it affords some insight to the thinking of the people in the regional laboratories.—JBM

INDUSTRIAL AND WATER POLLUTION (Survey of Legislation and Regulations)

Marvin D Weiss (R S Aries and Associates)
Chemonomics, Inc
400 Madison Ave, New York, N Y
1951. 142 pages. $5.00
Lithoprint, paper bound

Recent concern over the pollution of waterways by municipalities, industry, and agriculture has increased federal government and state legislative action to a point where it has become necessary to keep industry abreast of the very latest local requirements governing water pollution.

This up-to-date publication is a complete, concise presentation of the essential aspects of legislation in 46 of the 48 states (Colorado and Wyoming excepted), the District of Columbia, Hawaii, Puerto Rico, Alaska, and the Virgin Islands. The book highlights federal standard legislation governing water pollution as well as that of the various interstate agencies active in pollution control. The state-by-state summary stresses the effect of the laws upon industrial establishments within the state and includes complete standards of water quality wherever they have been adopted.

This book is a valuable asset to industry, not only in the coordination of their efforts with government legislation designed to protect and preserve our waterways, but also in the far-reaching goal toward conversion of pollutive wastes into profitable by-products. A comparison volume, describing what the chemical process industries are doing about water pollution problems is being prepared by the authors for appraisal and comment.

Since this publication has been prepared in a paper bound volume, it is presumed that frequent revisions will be made to keep abreast of regulation changes.—EPJ

ADHESION AND ADHESIVES

N A de Bruyne and R Houwink
Elsevier Publishing Co, Inc
250 Fifth Ave, New York 1, N Y
517 pages—$10.00.

As far as the reviewer is aware, this is the only text that treats exclusively the subject of adhesion, covering both theoretical and practical aspects. As such, it is a must for specialists in the field, even though their own special field of interest may not be covered. References to textiles are somewhat sparse, but two pages are devoted to the use of animal glues in the processing and sizing of rayon.

The book is written in two parts, the first dealing with the theoretical aspects of wetting and adhesion; the second, with the technological aspects. Thus, in the latter, the industrial uses of animal glues, vegetable adhesives, synthetic resin adhesives, asphaltic bitumen, sodium silicate, inorganic cements, rubbery adhesives and metallic solders are reviewed by experts. Among these may be mentioned F Chapman, E D Comwell, W M Lee, W R Lewis, R N J Saal, G Salomon, W J K Schonlau and John H Wills.

The book is well printed on good paper but suffers from some misspellings and lack of an adequate index.—GB

AN INTRODUCTION TO THE CHEMISTRY OF THE SILICONES

Eugene G Rochow
Second Edition
213 pages; $5.00

The second edition of this text is a useful, readable introduction to the exciting new compounds of silicon. Although written by an eminent research chemist, the presentation is such as to appeal to the interest of the man in the plant. The textile chemist will be particularly interested in Chapter 6—"Properties of Specific Silicone Polymers", and Chapter 8—"Water Repellent Films and Protective Coatings from Organo-silicon Materials". Chapter 6 includes a discussion of various silicone resins, silicone oils, and silicone rubbers; Chapter 8 discusses briefly the water repellent properties of the silicones, which have an immediate textile application.

The last chapter in the book presents eleven tables of physical data on the properties of different classes of organo-silicon compounds, together with a bibliography of over 500 references to the original literature on the individual compounds. The book is well-indexed for easy reference, having both a subject and an author index.—JBM

NEWS

CORRECTION

On page 796 of the December 10th issue (1951) erroneous reference to the use of *sodium chloride* as a stripping agent appears near the end of the descriptive material on Eastman Fast Blue GLF Concentrated and on Eastman Fast Yellow 8GLF. In each case, stripping should be done with sodium *chlorite* and formic acid.

• Hooker Reveals Expansion Plans

Hooker Electrochemical Company, Niagara Falls, N Y, recently revealed two phases of their current expansion plans, which call for a new $10,000,000 plant for the manufacture of chlorine and caustic soda at Montague, Michigan and a $5,000,000 construction program for its Tacoma, Washington plant to increase output of the same commodities.

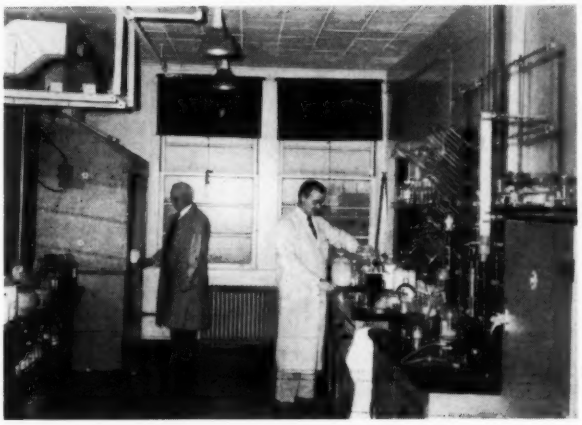
Hooker has arranged for purchase of a substantial acreage from the Tacoma Port Authority and dredging operations soon to get underway will reportedly provide deep water facilities for shipping chlorine and caustic soda by barge.

The new Michigan plant is expected to be in operation by the end of 1953, according to R L Murray, Hooker president. The yearly production rate, reportedly scheduled at 100,000 tons, will be aimed primarily at Midwest industry. Total plant area comprises over 400 acres, with brine wells a short distance from the plant site. Water, electric power, and shipping facilities are reported to be excellent.

• Operations Begin at New Baker Unit Process Plant

With the beginning of operations at their new unit process plant last month, the J T Baker Chemical Co, Phillipsburg, N J, looks to greatly increased production of their line of inorganic chemicals, according to Marion W Smith, president. The plant is part of a $3,000,000 expansion and modernization program scheduled for completion this year.

The new plant utilizes closed, corrosion-resistant, automatic equipment for high volume production of high-purity inorganic chemicals, many of which find application in textile finishing and as laboratory reagents.



Part of the Newly-Expanded Laboratory Facilities of the Bryant Chemical Corporation at Hingham, Mass.

• Bryant Enlarges Hingham Laboratory

Bryant Chemical Corp, N Quincy, Mass and Spartanburg, S C, has expanded the facilities of their textile laboratory at Hingham, Mass, at which the development of special finishes, printing gums and slashing chemicals will be carried on. Lester C Conner and William B Briggs are now in charge.

• Koppers Plans More Expansion in Chemical Field in 1952

In a year-end statement, Gen Brehon Somervell, chairman and president, stated that Koppers Company, Inc, plans to "vigorously pursue" its expansion in the chemical field in which it has made rapid progress in recent years. While pointing out that continued improvement and development will be carried on in all of the six Company Divisions, the Koppers President asserted that development of chemical producing facilities will be given particular attention as it was in the past year.

"A sixth plant of our Chemical Division will go into operation during 1952, while our five present plants are being expanded to produce, in some cases, 50 per cent greater volume," General Somervell said. "The new plant—now under construction at Port Arthur, Texas—will produce ethylbenzene. The site we have purchased at Port Arthur is large enough to allow construction of future additional plants for production of petro-chemical products".

General Somervell reported that 1951 was a favorable year for Koppers with sales reaching an all-time high and profits continuing good despite higher taxes. For 1952, he said, Koppers has a backlog of orders in excess of $200,000,000.

• Reliance's Euclid Plant Opens

The new $1,800,000 Euclid (Ohio) Plant of the Reliance Electric & Engineering Company has been put into operation as 425 employees of the company's engineering, development, research, renewal parts and tool departments finally wound up the two-week job of moving into the new facility from the firm's two plants on E 152nd Street, Cleveland.

To celebrate the occasion, a brief plant-opening ceremony was held last month by the company. In attendance were a host of Reliance executives and employees as well as guests from Euclid.

Built in nine months at a cost of approximately $1,800,000, which includes certain production equipment and related service facilities, the plant is a single-story structure, 442-ft long and 352-ft wide with a total floor area of 133,000 sq ft.

On schedule, Monsanto Chemical Company's new elemental phosphorus plant takes shape on the 500-acre site near Soda Springs, Idaho. Office and service buildings as well as foundations for the initial electric furnace are nearing completion. Strip mining of phosphate deposits has begun to permit stockpiling prior to the start of operations planned for the latter part of this year. The new electric furnace is the company's seventh. There are six electric furnaces producing elemental phosphorus at Monsanto, Tenn. The plant is being erected by the Morrison-Knudson Company of Boise, Idaho.

• Plastics Exposition Names Winners in Slogan Contest

"Plastics Personify Progress" is the winning entry in the Slogan Contest conducted by the Fifth National Plastics Exposition, sponsored by The Society of the Plastics Industry, Inc. The Exposition will take place March 11-14 in Convention Hall, Philadelphia, Pa. The author of the slogan and winner of the $500 first award was George Whyte, sales manager of the Dominion Comb & Novelty Co, Montreal, Quebec.

• Du Pont Rayon Dep't Changes Made Effective

The reorganization of the du Pont Company's Rayon Department "to meet the requirements of its present expanding production and product lines" became effective the first of last month. In addition to organizational and personnel changes, the department's name is now officially the "Textile Fibers Department".

The new plan of organization places the manufacturing of all the department's products in one division and the sales of all products in another. The Rayon Department produces all five of du Pont's man-made textile fibers. Heretofore they have been grouped into three divisions, each division handling its own production and sales. These three have been abolished and their activities taken over by the two new units.

• Acetate Information Material Ready for Mills, Converters

To aid mills and converters in complying with the new fair trade practices for the chemical fibers industry, recently announced by the Federal Trade Commission, Celanese Corporation of America has established an Acetate Information Bureau which will furnish fiber identification material suitable for use with acetate yarns and fabrics.

The FTC ruling, promulgated on December 11, makes it mandatory to differentiate between fabrics made of acetate fibers and those made of rayon (viscose or cuprammonium process) fibers in all labeling, advertising and sales promotion material.

• CCNY Students Visit United Piece Dye

The United Piece Dye Works, Lodi, N J, were hosts on Dec 1 to a group of 60 students of the Applied Textile Exporting class of The City College School of Business.

The field survey to acquaint the students with the operations of a textile dyeing and printing plant was arranged through Herman Baumann, United's research director, and Leon B Rosenblatt, instructor at The City College. The plant tour was highlighted by visits to the dye house, greige room, color shop and the printing department.

• Heyden Becomes Joint Owner of New Canadian Firm

St Maurice Chemicals Limited of Montreal has been selected by Heyden Chemical Corporation and Shawinigan Chemicals Limited, subsidiary of The Shawinigan Water and Power Company of Montreal, as the Canadian corporation to carry out their joint program to build a $2,000,000 plant at Varennes, Quebec to manufacture annually 30,000,000 pounds of formaldehyde and 3,000,000 pounds of pentaerythritol.

This announcement recently was made jointly by John P Remensnyder, president of Heyden Chemical Corporation and V G Bartram, president of Shawinigan Chemicals Limited, whose companies will share fifty-fifty in ownership of St Maurice. Survey work is now under way and construction of the new plant, covering 30 acres, is expected to be started next spring.

Mr Remensnyder has been elected Chairman of the Board of St Maurice Chemicals Limited and Mr Bartram, President. Other officers include H S Reid, vice president, Dr Ralph N Lulek, vice president, P W Wright, secretary and Simon Askin, treasurer.

Heyden representatives on the St Maurice Board of Directors are Paul van der Stricht, Mr Askin, Dr Lulek and Mr Remensnyder, all officers and directors of Heyden. The other members of the new board are Dr H S Sutherland, P W Blaylock, Mr Reid and Mr Bartram, all associated with Shawinigan Chemicals Liimted.

The joint Heyden-Shawinigan enterprise is adopting the name and revised charter of a company which was formed in 1942 as an associate of Shawinigan Chemicals. The head office of St Maurice Chemicals Limited will be in the Shawinigan Building, Montreal.

Other recent moves by Heyden in line with their program of integration in the fields of fine chemicals and antibiotics include the sales of two Detroit subsidiaries, the Jamieson Pharmacal Company and the Nyal Company (drug sundries), and the sale of all stock in their wholly-owned Canadian subsidiary, C E Jamieson and Co (Dominion) Ltd.

• Pacific Mills Plays Xmas Host to Children

Approximately 300 children, nuns and elderly women (all residents of the Protectory of Mary Immaculate in Lawrence, Mass) were treated to their fourth Annual Christmas Party on December 20th in the institution's auditorium. A half-hour radio program over station WLAW carried the highlights of the Pacific Mills-sponsored event.

• Research, Construction Top 1951 Chemstrand Activity

Research and construction progress leading to commercial production and marketing of the firm's synthetic textile fibers keynoted activities of the Chemstrand Corp, Decatur, Ala, during 1951, according to a year-end review by President Osborne Bezanson.

Chemstrand is engaged in construction of its headquarters building, research and development center, and Acrilan* acrylic fiber manufacturing facilities on a 700-acre site at Decatur, and in building its nylon filament yarn plant on a 2,000-acre site near Pensacola, Fla.

"Our activities during the year centered around research and development of Acrilan in the Marcus Hook, Pa, pilot plant; design and construction of the plant office and research facilities at Decatur; design planning and preliminary construction of the Pensacola nylon plant; organizing the principal staff departments, and launching a program of working with important segments of the textile industry in experimental development of fabrics containing these man-made fibers," Mr Bezanson said.

"Good progress in all activities has been noted," he continued. "We anticipate being in a position to meet the potentially high demand for our products at an increasing rate during the coming year."

Mr Bezanson said that the past 12 months included these significant developments:

Negotiations started some months previously culminated in an agreement last June, 1951, whereby Chemstrand was licensed by E I du Pont de Nemours & Company, Inc, Wilmington, Del, to produce and market nylon filament yarn. The agreement calls for du Pont to design and build the plant. Sam Krewatch, du Pont field project engineer, and Fred G Gronemeyer, chief engineer of the Chemstrand nylon project are heading this program.

The nylon plant site along the Escambia River, north of Pensacola, was purchased from St Regis Paper Co and other groups. By year end, St Regis was engaged in clearing matured pulpwood trees from the area and preserving seedlings in keeping with good forest management practices. Grading of roadways and laying of rail sidings was nearly completed. A warehouse had been erected and foundations begun on three construction buildings which will be used by employees until the permanent office building is completed.

Meanwhile, Roy G Hemminghaus, Chemstrand nylon plant manager, and his staff organized temporary nylon offices at Wilmington, Delaware, to work with du Pont teams preparatory to bringing the Pensacola plant into commercial production in 1953. The plant has a designed capacity of 50,000,000 pounds per year.

* Acrilan made its initial trade show appearance Oct 17-19 at the AATCC's 30th Annual Convention.

• New DCAT Appointments

The following members from the Drug, Chemical and Allied Trades Section were recently elected officers and directors of the New York Board of Trade:

Vice President—Fred J Stock (VP, Chas Pfizer & Co, Inc)

Treasurer — Robert B Magnus (VP, Magnus, Mabee & Reynard, Inc)

Directors—

George S McMillan, VP, Bristol-Myers Company;

J P Remensnyder, Pres, Heyden Chemical Corp (re-elected);

Stanley I Clark, Sterling Drug Inc;

John A Ewald, Avon Products, Inc;

C M Macauley, Pro-phy-lac-tic Brush Co;

Fred G Singer, E I du Pont de Nemours & Co, Inc;

and Mr Magnus.

• Aries & Associates Open Tokyo Office

R S Aries & Associates, Consulting Engineers and Economists, New York, have opened a branch office in Japan, headed by H F Alber, chemical engineer and consultant to the Japanese Government, and formerly with the American Occupation Forces. The office is located at 19 Shin—Sakurada—Cho, Shiba Minato—Ku, Tokyo, Japan.

The expanding activities of the Aries organization in countries of the Far East, especially in Japan, necessitated the organization of permanent representatives in that area, it is pointed out. Aries & Associates have been instrumental in reactivating and bringing improved production methods to the chemical process industries of Asia.

• IMCC Acquires Eastern Clay Stock

International Minerals & Chemical Corporation has acquired all of the outstanding capital stock of Eastern Clay Products, Inc, and simultaneously created a new Industrial Minerals Division, into which that company will be absorbed, it is learned. (International now has five product divisions: phosphate, plant food, potash, amino products and industrial minerals.)

Eastern Clay Products produces swelling bentonites and other grades of bentonites and clays.

• Ground Broken for Huge Petro-Chemicals Plant

Ground was broken on December 6, near Tuscola, Illinois, for the new plant of National Petro-Chemicals Corporation, which reportedly will be one of the largest plants of its kind in the world, employing nearly 300. National Petro-Chemicals was organized in June, 1951 by National Distillers Products Corporation and Panhandle Eastern Pipe Line Company on a 60-40 per cent participation basis. This step marked National Distillers' third expansion in the chemical field in less than two years.

John E Bierwirth has been named president of the new corporation. He is also president of National Distillers Products Corporation. Vice Presidents are Dr Robert E Hulse, director of research for National Distillers, and Edward Buddrus, president of Panhandle Eastern Pipe Line Company. Secretary and treasurer is Thomas A Clark, who serves National Distillers in the same capacity.

The new plant, which will cost in the neighborhood of $32,000,000, is being built primarily for the recovery of ethane from natural gas transported through the Panhandle pipe line system.

• New Borden Chemical Research Lab

Construction work on a new $365,000 research laboratory has begun by the Borden Company's Chemical Division in Philadelphia. The laboratory, scheduled for completion in June, will be adjacent to the company's Durite molding compounds and industrial resins plant. It reportedly will be housed in a one-story building made of steel, concrete and glass with a total floor space of approximately 11,000 square feet, and will employ about 40 technical and nontechnical workers.

Research emphasis will be on development of new techniques and chemical products such as synthetic resins, coatings and binders. Other research will be conducted with resinous materials derived from furfural, phenol and resorcinol; ammonia in form of urea and methanol; formaldehyde and derivative vinyl polymers and proteins.

• Cotton Research Clinic to Meet in Pinehurst

The 1952 Cotton Research Clinic will meet in Pinehurst, N C, February 13-15, according to an announcement by Dr Leonard Smith, the National Cotton Council's director of utilization research. The 1952 Clinic, following the pattern of previous years, will concentrate on the industry's most pressing technical needs.

• PTI Alumni Banquet Set for Feb 8

The 51st annual mid-winter banquet of the Philadelphia Textile Institute Alumni Association has been scheduled for Friday evening, Feb 8, 1952. The annual event will be held at the Warwick Hotel, Philadelphia.

• U S Sec'y of Commerce Addresses Convocation at LTI Open House

Members from industry, education, government and commerce were on hand last month for the two-day Open House and Special Convocation of the Lowell Textile Institute, among the highlights of which was an address by Charles Sawyer, U S Secretary of Commerce. Mr Sawyer's talk, "New England Looks Ahead", preceded the conferring of honorary degrees by President M J Lydon to five outstanding men in government, industry, research and education.

The Institute's Open House program on December 14th gave industrialists, machine manufacturers, and invited guests an opportunity to witness machines in operation as well as to discuss pertinent problems with specialists on the Institute's staff. Officials at the college felt it to be an unusual opportunity for interested persons to become acquainted with the services offered by the Institute and to allow those who wish to study modern textile equipment to do so in a concentrated area. Tours of inspection for the general public were conducted in the evening.

Object of the Open House program was to acquaint those who visit the Institute with its unique physical and educational quality and potential scope as an actual and powerful adjunct to the betterment of the textile and other industries in the East.

President Lydon and Nils Y Wessell, vice president of Tufts College addressed high school principals and guidance counselors on December 15th while LTI student representatives entertained visitors from New England's high schools with a program in Southwick Hall. The Air Force ROTC unit closed the program with a retreat ceremony.

Recipients of honorary degrees included Mr Sawyer; Edward T Pickard, secretary of the Textile Foundation; Walter J Hamburger, director, Fabric Research Laboratories; Harold W Leitch, general superintendent and director, Technical Laboratories, Pacific Mill Worsted Division; and George T Metcalf, executive secretary of the New England Textile Foundation.

James F Thompson (rear), general manager of the Hilton-Davis Chemical Company, explains the approach to a problem in the development of dyestuffs to three new cooperative students from the University of Cincinnati who were hired by the company. Chemical engineering students in the cooperative program devote almost half of their time to work and practical experience in industry.

Marking its 20th year of participation in the program, Hilton-Davis has now assisted in the education of 100 "co-ops".

(Left to right): Stephen Kiorpes of Yonkers, N Y, and Roger Schanzle and James Funk of Cincinnati.

• Arnold-Hoffman in BCIT Location

Full stride was reached last month at the newly-opened laboratory, warehouse and distribution plant of Arnold, Hoffman Co, Inc, one of the latest of more than 30 industries to locate at the Bergen County Industrial Terminal in Teterboro-South Hackensack, N J.

The new terminal plant is of brick and steel with 10,000 square feet of floor space. Alexander Summer Industrial Service Co arranged for the land, financing, design and construction.

• CCA Establishes Annual Fellowships

A program designed to produce sound technically-trained personnel for the man-made textile fiber industry through the establishment of annual fellowships at four textile colleges in the country was announced recently by George Schneider, senior vice-president of the Celanese Corp of America, New York.

"As an initial move in this program," Mr Schneider stated, "five graduate fellowships for advanced work in textiles have been created by the corporation. Two of these will be at Lowell Textile Institute Research Foundation, Lowell, Mass, and one each at North Carolina State College, Raleigh, N C, Clemson College, Clemson, S C and Georgia Institute of Technology, Atlanta, Ga.

• Reliable Color and Chemical Becomes Canadian Representative for "Cunilate"

Gerald Eisenschiml, president of Scientific Oil Compounding Company, Inc, Chicago 23, Ill, has announced the appointment of Reliable Color and Chemical Company, Hamilton, Ontario, as exclusive representative in Canada for Cunilate (solubilized copper-8 quinolinolate) and related products. Thomas Rostron of the Montreal office, and Edward McCoy of the Hamilton office will be in charge of all sales, and will serve as technical advisors on the use of Cunilate-type fungicides in textile applications.

• AOCS to Offer Short Course at Rutgers

The American Oil Chemists Society will offer a one week short course in cooperation with Rutgers University July 6-11th. The following details are announced by Dr Foster Dee Snell, Chairman of the Committee on Arrangements. There will be five speakers each day on the subjects:

July 7—Soap Raw Materials
July 8—Soap Processing
July 9—Soap Properties
July 10—Surfactants and Syndets
July 11—Evaluation Methods

Afternoon inspection tours of typical plants will be offered for four days of the course.

The fee including room and board from late Sunday through Friday PM is $90. Reservations should be made through the office of the society, 35 East Wacker Drive, Chicago 1, Illinois, and are limited to 200.

• New Courses Offered by CCNY

City College Midtown Center is offering several new textile courses to meet the increasing demand in the New York area for fundamental textile knowledge.

Courses especially designed to meet the needs of mill agents, dyers and finishers representatives, converters, buyers, apparel manufacturers, and sales and merchandising personnel, are as follows:

"Woolens and Worsteds" conducted by J J Press, Fiber Specialist, Research and Development Division, U S Navy;

"Cottons" conducted by Richard Light, Bates Manufacturing Company; and

"Rayons and Other Man-Made Textiles" conducted by C E Deglialberti, Research and Development Division, U S Navy.

• Augusta to Boost Naf-Sol Production

Henry I Gilbert, president of the Augusta Chemical Company, Augusta, Ga, has announced the company's intention to increase production of Naf-Sol, Augusta's line of ready-dissolved naphthols. The growing popularity of the packaged, liquid naphthols is reflected in their being supplied to more than fifty firms since their introduction just over a year ago.

• Pennsalt to Add Chlorine Unit at Calvert City, Ky

Beginning the second major step in the development of its Calvert City, Ky, works, the Pennsylvania Salt Manufacturing Company recently announced that it will add new facilities, including an electrolytic chlorine-caustic soda unit, at an estimated cost of $8,000,000.

As the first step, Pennsalt completed a hydrofluoric acid and sulfuric acid plant in 1949 on its Tennessee River location near TVA's Kentucky Dam. These facilities have been expanded by the addition, in 1950, of a unit to produce end products from captive hydrofluoric acid and, now nearing completion, a 33 per cent increase in hydrofluoric acid capacity.

Addition of the new unit, slated for operation in early 1953, will combine at one works four basic chemicals—hydrofluoric acid, sulfuric acid, chlorine and caustic soda. A departure in the new unit from Pennsalt's usual chlorine-caustic soda production will be the use of the DeNora electrolytic mercury cell.

In the development of Calvert City as an integrated center of chemical industry, it was pointed out that the Air Reduction Co is building a calcium carbide and acetylene plant in the same area. Availability of such basic chemicals in combination will probably attract further chemical production to the area. The B F Goodrich Chemical Co also has announced plans to build a vinyl chloride plant on property adjacent to that of both Pennsalt and Air Reduction.

• Carew Tower Site of New Hercules Sales Office

A new sales office to serve the areas of Cincinnati, Louisville, Indianapolis, Dayton and Columbus was opened on January 2nd for the Hercules Powder Company's Synthetics Department. The new office is located in Cincinnati's Carew Tower, in which Hercules also maintains a sales office of their Cellulose Products Department.

It is learned that Synthetics will also have warehouse facilities in Cincinnati in addition to their present facilities in Louisville.

Frank W Beavers, formerly of the department's Cleveland office, has been named technical representative for the new Cincinnati site.

• TRI Technical Director Addresses Lowell Textile Alumni Chapter

Fifty-five alumni of the Lowell Textile Institute were in attendance at New York's Princeton Club on December 10 for the semi-annual meeting of the New York Chapter.

Featured speakers at the parley included Dr John H Dillon, director of the Textile Research Institute, who spoke on "The Work of Textile Research Institute as It Relates to the Textile Industry", and J Douglas Hood, a Scottish textile manufacturer, who discussed aspects of the Conservative victory in the recent British elections as it relates to the manufacturer.

• L-O-F Ships First Fiber Glass

December saw the first shipment of textile fiber glass dispatched from the new Fiber Glass Division factory of the Libbey-Owens-Ford Glass Company, Toledo, O.

Donald L McClure, factory manager, points out that the Company has put 25% of their capacity for making glass yarns into operation and will continue to set up additional machines and train necessary personnel to man them.

First of the factory's superfine glass fiber in mat form was produced and shipped by Nov 16 and since then an additional superfine tank has been started on "B" fibers giving the plant 50 per cent of its capacity for this type of fiber glass now in operation.

COMING EVENTS

ACHEMA X
Exhibition Meeting for Chemical Engineering May 18-25, Frankfort/M, Germany.

AMERICAN CHEMICAL SOCIETY
7th National Chemical Exposition Sept 9-13, Chicago Coliseum, Chicago, Ill.

AMERICAN SOCIETY FOR TESTING MATERIALS
Spring Meeting and Committee Week, March 3-7, 1952, Cleveland, Ohio.

Annual Meeting, June 23-27, 1952, New York, N Y. (The biennial Apparatus and Photographic Exhibits will be held in conjunction with this meeting).

1953—Spring Meeting (Hotel Statler, Detroit, Mich.)

Annual Meeting (Chalfonte-Haddon Hall, Atlantic City, N J.)

1954—Spring Meeting (Shoreham Hotel, Washington, D C)

Annual Meeting (Sherman Hotel, Chicago, Ill.)

AMERICAN STANDARDS ASSOCIATION
3rd National Standardization Conference, Sept 8-10, Museum of Science and Industry, Chicago, Ill.

34th Annual Meeting, November 19, Waldorf-Astoria, New York N Y.

BRITISH INDUSTRIES FAIR
May 5-16, London and Birmingham, England.

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS
Annual Meeting (Quebec Section) April 25-26, Mount Royal Hotel, Montreal, Que.

CANADIAN TEXTILE SEMINAR
September, Queens University, Kingston, Ont.

CHICAGO INTERNATIONAL TRADE FAIR
Mar 22-April 6, Navy Pier, Chicago, Ill.

FIBER SOCIETY
Meeting: April 16-17, 1952 (Clemson House, Clemson, S C.)

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS
41st Knitting Arts Exhibition, April 27-May 1, 1953, Atlantic City Auditorium, Atlantic City, N J.

NATIONAL COTTON COUNCIL
14th Annual Meeting, Jan 28-29, New Orleans, La.

Cotton Research Clinic, Feb 13-15, Pinehurst, N C.

NATIONAL KNITTED OUTERWEAR ASSOCIATION and UNDERWEAR INSTITUTE
Knitting and Allied Crafts Exposition, April 21-25, Grand Central Palace, New York, N Y.

NATIONAL ASSOCIATION OF TEXTILE MACHINERY MANUFACTURERS
Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantc City, N J.

NEW YORK BOARD OF TRADE
26th Annual Dinner of the Drug, Chemical and Allied Trades: March 6, 1952.
26th Annual Meeting: September 25-28, Pocono Manor Inn, Pocono Manor, Pa.

PHILADELPHIA TEXTILE INSTITUTE ALUMNI ASSOCIATION
51st Mid-Winter Banquet, Feb 8, Warwick Hotel, Philadelphia, Pa.

SOCIETE DE CHEMIE INDUSTRIELLE
25th International Congress for Industrial Chemistry, May 18-25, Paris, France.

SOCIETY OF PLASTICS INDUSTRY, INC
5th National Plastics Exposition, Mar 11-14, Convention Hall, Philadelphia, Pa.

TEXTILE INSTITUTE
Annual Conference, June 2-6, Edinburgh, Scotland.

NAMES IN THE NEWS

David M Musser

• Musser to Head RPC Research

Refined Products Corporation, Lyndhurst, N J, has announced the appointment of DR DAVID M MUSSER as their director of research. Dr Musser was formerly senior chemist in the research laboratories of Deering Milliken & Co, Pacific Mills, and until the acceptance of his new position, was head of the Textile Research and Development Division of Onyx Oil & Chemical Co.

• Merriman Becomes 1st Executive Secretary, TTFC

The appointment of JOHN M MERRIMAN as first Executive Secretary of the Textile Technical Federation of Canada, was announced in Montreal on Dec 7.

The Federation was formed 13 years ago and today co-ordinates activities of the Quebec and Ontario sections of The Canadian Association of Textile Colourists and Chemists, Eastern and Western divisions of The Textile Society of Canada, The Cornwall and District Textile Association and The Ottawa Valley Textile Association.

• McPherson, Kline Accept New NBS Posts

DR A T McPHERSON, formerly chief of the National Bureau of Standards Organic and Fibrous Materials Division has been promoted to the position of associate director of the Bureau, where he will be responsible for the coordination and direction of work in calibration, testing and specifications. He is succeeded in his old post by DR GORDON M KLINE, formerly assistant chief of the Division and chief of the Organic Plastics Section within the Division. He will retain the latter position for the present.

• Carl Puller Celebrates 75th Birthday

CARL PULLER, probably the oldest active member of the AATCC's New York Section, celebrated his 75th birthday on December 29th. Mr Puller, who has been with Pfister Chemical Works, Inc for the past 12 years readily admits that he is "75 years young and still feeling good."

A native of Krafeld, Germany, Mr Puller obtained his first experience in a silk dyehouse owned by the Puller family in Krafeld, the C A Puller Silk Dyeing Co. Following graduation from the Krafeld Textile School in 1898, Mr Puller came to the U S in 1901 to take a position with the Weidman Silk Company. He later went with Wm Becker's Co, which was eventually integrated into National Aniline. Prior to joining Pfister in 1939, he also spent some time in the employ of Ciba, Inc.

He is currently living in Hackensack, N J.

• CCA Names 3 Vice Presidents

Celanese Corporation of America has elected KENNETH G DONALD, G W SEYMOUR and JOHN D FENNEBRESQUE as vice presidents. Mr Donald will be in charge of foreign operations. For fifteen years previously, he was vice president of Robert Heller and Associates. Mr Seymour, who joined the company in 1932 will be in charge of technical control. Mr Fennebresque will be in charge of the chemical division, of which he has been general manager.

Meanwhile, the Chemical Division of CCA has announced the promotion of E F ELBIN in the position of district manager for the Southwest territory. He will represent the Chemical Division's organic chemicals and organic phosphates departments in New Mexico, Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama and part of Florida.

• Moore Promoted by Hooker

JOHN N MOORE has been promoted to Virgo sales supervisor, according to an announcement by R E Wilkin, general sales manager of Hooker Electrochemical Company, Niagara Falls, N Y. Until his recent appointment, Mr Moore was engaged in technical sales service for Virgo Descaling Salt and Virgo Molten Cleaner, and had been associated with development work on these products since 1946. His headquarters will be the Niagara Falls office.

• Joyner Appointed to Girdler Technical Staff

N T JOYNER, a prominent figure in the glyceride oil field, has been appointed to the technical staff of the Votator Division of The Girdler Corporation, Louisville, Ky.

Mr Joyner became associated with the Buckeye Cotton Oil Company, a subsidiary of Proctor & Gamble Co, in 1929 and later transferred his activities to the parent company. In 1932, he joined Lever Brothers Co, Cambridge, Mass, and attained the post of assistant director of research prior to joining Girdler.

• Cookman Appointed to Avisco Sales Post

ARTHUR S COOKMAN, JR, assistant manager of the Charlotte, N C, district sales office of American Viscose Corporation, has been named assistant manager of the company's rayon staple sales division in New York.

Mr Cookman has been associated with the Charlotte office of American Viscose since 1942. Previously he was connected with A D Juilliard and Company in a sales capacity.

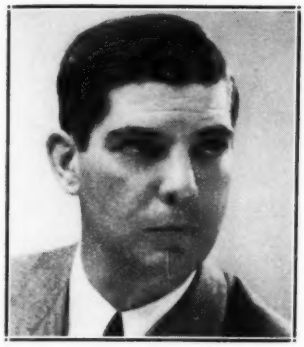
• Alexander Honored by French

A new honor has been bestowed upon JEROME ALEXANDER, charter member of the American Institute of Chemical Engineers. His portrait is now among the pictures of this country's most distinguished chemists in the Maison de Chemie in Paris. Presentation was made by Robert S Aries to the Maison de Chemie during the International Congress of Chemistry, held in France from Nov 22-Dec 2.

• ACCCE Appointees

The Council of Association of Consulting Chemists and Chemical Engineers, Inc., has made the following appointments for the calendar year 1952, viz:

ROBERT T BALDWIN, executive secretary and assistant treasurer; and A B BOWERS, director of publicity and assistant executive secretary.



C W Kohlman

T F Cooke

L A Fluck

• ACC Textile Resin Dep't Moves

Recent appointments within the Textile Resin Department of the American Cyanamid Company include the naming of CLEM W KOHLMAN as advertising and promotion manager; T F COOKE as manager of the Application Laboratories; and L A FLUCK as assistant to the Department's manager. Mr Kohlman's appointment took effect on Dec 1; the appointments of Messrs Cooke and Fluck, on Jan 1.

Sales promotion personnel who reported previously to the Metropolitan Sales Office will now report to Mr Kohlman. The move is designed to more closely coordinate expanding sales, promotion and advertising of ACC resin finishes.

Mr Kohlman has been the Department's advertising account executive since 1946, formerly with Grey Advertising Agency, Inc, and since 1948, with Roy S Durstine, Inc.

Dr Cooke joined American Cyanamid's Calco Chemical Division in 1940 as a research chemist. On his return to Calco from service, Dr Cooke was appointed assistant director of physical chemical research and in 1949 became assistant director of the Application Research Department.

Mr Fluck has been connected with ACC for the last 12 years, as manager of the Application Laboratories of the Textile Resin Department since 1948 and before that as a development chemist in Cyanamid's Textile Chemicals Department in Stamford, Conn. In addition to his general responsibilities in the Manager's office, Mr Fluck will be available for field consultations with mill development and finishing plant executives in regard to textile resin application techniques.

• Two SRRL Scientists Lauded

L to r: Dr Kyle Ward, Jr, Dr K S Markley and Maj Gen Roscoe B Woodruff.

Two scientists of the Southern Regional Research Laboratory were awarded certificates of appreciation by the Department of Defense recently for services rendered with the Technical Industrial Intelligence Committee, Joint Chiefs of Staff, during World War II.

The certificates were presented by Major General Roscoe B Woodruff, Commanding General of Camp Polk, La, and the XV Army Corps, to DR KYLE WARD, JR, and DR K S MARKLEY, at a ceremony in the Laboratory auditorium, at which Dr C H Fisher, director of the Laboratory, presided.

• New du Pont Post for Hale

THOMAS L HALE, JR, assistant manager of the Industrial Relations Division of the du Pont Company's Employee Relations Department, has been assigned manager of the Personnel and Industrial Relations Division of the Textile Fibers Department.

• Beller, Zoss, McKinley Assume New GAF Administrative Posts

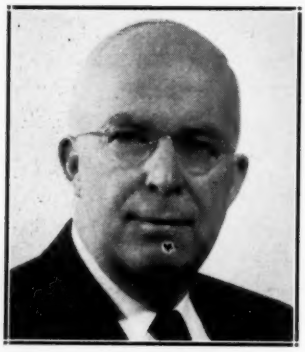
DR HANS BELLER, DR A O ZOSS, and DR CLYDE McKINLEY have assumed new administrative posts at the Grasselli plant, General Aniline & Film Corporation, Linden.

Dr Beller, formerly manager of the Special Products and the Sulphur Colors-Textile Auxiliaries Areas, has been named technical director of the New Fields Department, and Dr Zoss, heretofore superintendent of Special Products, has been advanced to plant production manager. Dr McKinley, formerly chemical engineering assistant to Dr Beller assumes the position formerly held by Dr Zoss.

It is also learned that CHARLES F MONTROSS has been appointed supervising chemical engineer in the Special Products Area, reporting to Dr McKinley.

• Wigington Named Phi Psi Executive Sec'y

JOHN T WIGINGTON, director of the Division of Technical Service, American Cotton Manufacturers Institute, Inc, has been appointed executive secretary of Phi Psi, national textile fraternity, by the organization's Grand Council president, M Earl Heard.



Donald M Martin

• Martin Appointment with GDC Takes Effect

The appointment of DONALD M MARTIN as advertising manager of the General Dyestuff Corporation became effective on January 1st.

Formerly advertising manager for the Antara Chemicals Division of General Dyestuff Corporation, Mr Martin is now in charge of programs for trade publication and direct mail advertising, trade shows and exhibits, and product literature. His duties also include the handling of advertising activities for the Product Development Department of the General Aniline Works Division of General Aniline & Film Corporation.

Mr Martin joined GDC in 1944 as sales manager of the Organic Chemicals Department. Previously he had operated the Aqua-Sec Corp, a textile chemical company that developed the first water-repellent process on silks.

• Wilson New Wool Council President

BYRON WILSON of McKinley, Wyoming, secretary of the Wyoming Wool Growers Association and vice-president of the American Wool Council since its inception ten years ago, was elected last month to succeed HARRY J DEVEREAUX as president of the Council. Mr Devereaux has held the post since 1945.

The election of Mr Wilson came at a meeting of the Council's Board of Directors in Portland, where the 87th annual convention of the National Wool Growers Association was held.

STEVE STUMBERG was chosen to fill Mr Wilson's post as vice-president of the Council. At the same time, Mr Devereaux was reelected to serve during 1952 with Mr Wilson and Mr Stumberg on the Board of Directors of The Wool Bureau. The Council is an affiliate of The Wool Bureau, having joined the International Wool Secretariat in 1949 in the formation of the Bureau.

• Rainard Appointed Director of Research

LEO W RAINARD has been appointed director of research for Alexander Smith, Inc, according to an announcement by A Griffin Ashcroft, vice president in charge of research and development.

Mr Rainard was formerly assistant director of research under Mr Ashcroft before the latter's election as an officer of the company earlier this year. Mr Rainard's appointment is part of a general realignment of Alexander Smith's research and development activities. Prior to joining Alexander Smith in 1947, he held positions with Atlantic Research Associates, General Latex and Chemical Company and the Institute of Textile Technology.

• McCarthy Heads ACS Division

DR JOSEPH L McCARTHY, head of the department of chemistry and chemical engineering at the University of Washington (Seattle), was recently elected chairman of the American Chemical Society's Division of Cellulose Chemistry for 1952. He succeeds DR WAYNE A SISSON, section head of rayon research for the American Viscose Corporation, Marcus Hook, Pa.

KYLE WARD, JR, of the Southern Regional Research Laboratory, New Orleans, La, was chosen chairman-elect and DR WILLIAM E DAVIS of the Hercules Powder Company, Wilmington, Del, was named secretary.

• Dannerth Maintaining Consulting Office

DR FREDERIC DANNERTH is no longer associated with Scholler Bros, Inc, as listed in the 1951 AATCC Technical Manual and Year Book. He maintains an office as Consulting Chemist and Research Chemist in Glenside, Pennsylvania in the Philadelphia Metropolitan area. Dr Dannerth specializes in the formulation of rotogravure inks, printing pastes, coatings for textiles and paper, plastic resin films and leather. He has specialized in the field of synthetic resins, organic pigments and synthetic rubber latex and worked on formulations of oil-in-water dispersions for pigmented textile printing pastes as early as 1938.

• Sagarin Resigns Sindar Post

EDWARD SAGARIN has resigned as advertising manager of Sindar Corporation. Miss R F BACON has assumed the responsibilities of acting advertising manager.

J M Briley

• Briley Starts with Owens-Corning

JOHN MARSHALL BRILEY left the New York law firm of Shearman & Sterling & Wright, of which he had been a partner since 1940, to accept a vice-presidency with Owens-Corning Fiberglas Corporation, it is learned. Mr Briley on Jan 1 assumed general executive responsibilities, including relationships with foreign and domestic licensees, direction of certain development projects, and formulation of corporate policies. His headquarters are in the Fiberglas general offices in Toledo.

• ACC Appointments

American Cyanamid Company has announced that ROLLIN P FISCHER has been named manager of the Employee Relations Department and that J C BARTHAL has been placed in charge of new products development for the Paper Chemicals Department, where he will report to the technical director.

Mr Fischer joined the firm's Calco Chemical Division in February, 1945 as Supervisor of Labor Relations where he handled labor negotiations and other labor relations matters for all of the Calco plants. Before joining Calco, Mr Fischer was employed by General Motors Corporation as a supervisor of labor relations.

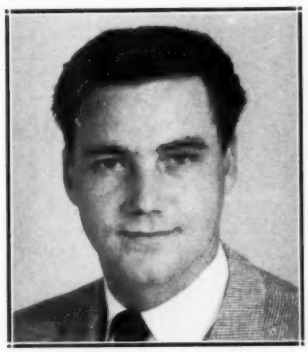
Mr Barthal was formerly senior chemical engineer at the Company's Stamford Research Laboratories.

• Hercules Executive Retires

PETRUS W MEYERINGH, vice president, director, and member of the executive committee of Hercules Powder Company, retired last month for reasons of health.

His retirement ends an association with Hercules Powder Company which began nearly 30 years ago in The Hague, Holland. In various executive capacities, he has actively participated in many of the company's progressive developments for the last 30 years.

J E Myrick



Wm R Simpson

T W Kitchen

• Two New Stein, Hall Appointments

Stein, Hall & Co, Inc has assigned WM RODNEY SIMPSON and J E MYRICK to posts in the South. Mr Simpson, who has received extensive training at the Stein Hall laboratories in New York and Charlotte, has been named as technical salesman in the state of Georgia. He will reside in Atlanta and work out of the Atlanta Branch. Mr Myrick will also work out of the Atlanta office, calling on the trade in Alabama and Mississippi.

• Kilcran Joins Ultra

J W KILCRAN has joined Ultra Chemical Works, Inc, Paterson, N J, Joliet, Ill, and Hawthorne, Cal, as sales, merchandising and advertising counsel. His headquarters will be in the Paterson offices.

Mr Kilcran served in a similar capacity with the Colgate-Palmolive-Peet Company for many years prior to accepting his new post with Ultra.

• Harris Now Operating Own Business

JOHN P HARRIS, who ended a long career with the Industrial Chemical Sales Division of West Virginia Pulp and Paper Company on December 1st when he reached retirement age, now is operating his own chemical sales business at 1791 Howard St, Chicago.

The firm handles both powdered and granular activated carbons, precipitated calcium carbonates and filtration materials.

Mr Harris' wife, Mildred James Harris, is vice-president of the new corporation, and his son, James T Harris, is secretary.

• A M Kahn Elevated by CPC

At a testimonial dinner tendered to A M KAHN at the Waldorf-Astoria on the occasion of the 35th anniversary of the founding of the company, he was elevated to Chairman of the Board of the Consolidated Products Company, Inc, 15 Park Row, New York. HERMAN KAHN was elected president and M I COWEN was elected treasurer.

• Westvaco Advances Sales Division Personnel

A series of advancements within the Sales Division, Westvaco Chemical Division, Food Machinery and Chemical Corporation, New York became effective on January 1.

ARTHUR F SMITH, previously division sales manager for solvents, barium chemicals and Magnesol, is the new divisional sales manager for alkalis, succeeding W N WYATT, who has been appointed district sales manager at Chicago.

W L SAGER, previously assistant district sales manager for the New York area, is now divisional sales manager, solvents and Magnesol. He is succeeded by WILLIAM HOLLEMAN who had been New England Sales Representative for Westvaco.

J G BRONSON, who has been assistant divisional manager, magnesium chemicals, assumes the post of divisional sales manager, barium and miscellaneous chemicals. Mr Bronson is succeeded by J PETERSON, who was until recently at Westvaco's Pocatello elemental phosphorus plant.

• Phi Psi Honors Fred Scholler

FRED C SCHOLLER, Scholler Brothers, Inc, was awarded an honorary degree in Phi Psi Fraternity at an installaiton banquet at the Philadelphia Textile Institute recently.

Noting his contributions and services to the textile industry and the field of textile education, PTI was represented in the presentation by Theodore B Hayward, chairman of the Board of Trustees.

• Kitchen to Handle Cook-P & N Southern Representation

Cook-P & N Machine Co has announced the appointment of THOMAS W KITCHEN as Southern representative.

Mr Kitchen's headquarters are at 1201 South Carolina National Bank Building, Greenville, S C.

Mr Kitchen, a graduate of Clemson College, was formerly with Dan River Mills and, previously, North Carolina Finishing Company.

• Singer Honored at Testimonial

CHARLES J SINGER, manager of the Chicago office of The William Carter Co, Needham Heights, Mass, was guest of honor at a testimonial dinner recently commemorating his 50th year of service with the company. The affair was held at the Hotel Kenmore, Boston, and was attended by executives, salesmen and a group of close friends.

The high esteem in which Mr Singer is regarded by his co-workers was expressed by many tributes and gifts.

Toastmaster for the occasion was William L Carter, second vice president and director of advertising, who lauded Mr Singer for setting a pace that is a challenge to younger sales force members.

Mr Singer joined the Carter company in 1902. He began his service in the New York office and was transferred to Chicago three years later.

• Keppler New Ultra-Penn Manager

RICHARD G KEPPLER has been named manager in charge of production of the Ultra-Penn Refining Company, Bruin, Pennsylvania, a wholly-owned subsidiary of the Borne, Scrymser Company.

Mr Keppler will continue his duties as chief chemist of the parent company.

OBITUARY

Russell I Baker

RUSSELL I BAKER

RUSSELL I BAKER, plant manager of the Grasselli Works Division, General Aniline & Film Corporation, with which he had served for more than thirty-one years, and a leader in the development and production of early dyestuffs in the country, died on December 11 of a heart attack. He succumbed shortly after being stricken while addressing a Rotary Club luncheon meeting at the Reformed Church parish hall in Linden. He was 59.

Born at Beavertown, Pa, Mr Baker attended Lewistown Preparatory School and Lehigh University. After leaving Lehigh in 1912, he worked two years in the Altoona (Pa) Laboratory of the Penn Central Light and Power Company. He returned to Lehigh, where he was graduated in 1916, after which he became a chemist and mill superintendent for the Pennsylvania Trojan Power Company of Allentown, Pa. He enlisted in 1917 as an Army Air Corps cadet, won his wings as a pursuit pilot and a commission as a lieutenant.

Mr Baker returned to the chemical industrial field in 1919 as assistant head of the acid intermediate department of the Newport Chemical Company, Carrollville, Wis. He joined General Aniline & Film in July, 1920, and was active in the development and production of early dyestuffs, including alizarine colors. When the vat colors department was established in 1928, he was made assistant department head, and in 1942 he was made department head.

Funeral services in Elizabeth were largely attended on December 13. Internment took place in the Old Zionsville Burial Grounds, Old Zionsville, Lehigh County, Pa, the following day.

JOHN F SEGELCKE

JOHN F SEGELCKE, sales manager of the Organic Acids and Plasticizers Department of American Cyanamid Company's Industrial Chemicals Division, died suddenly on December 1st at his home in Teaneck, N J.

Mr Segelcke joined Cyanamid in 1921, following his attendance at Columbia and New York Universities. He was a member of the Phthalic and Maleic Anhydride Industry Advisory Committee of the National Production Authority as well as the SOCMA.

He is survived by his wife, Josephine.

JAMES G VAIL

DR JAMES G VAIL, retired vice president of the Philadelphia Quartz Company, Philadelphia, died December 11th in New Delhi, India, where he was working at the Friends International Center for the American Friends Service Committee. He was 65.

Dr Vail joined the Philadelphia Quartz Company in 1905 as a chemist. He became chemical director in 1931 and vice president in 1940. Several years ago he began a gradual retirement from the business but continued to serve as a member of the Board of Directors.

An authority on soluble silicates, Dr Vail's publications and patents were largely on this subject. In 1928 his first American Chemical Society Monograph, "Soluble Silicates in Industry", was published. For this and his many other publications and lectures on silicates, he was awarded the Chemical Industry Medal in 1933 by the Society of Chemical Industry. Before his departure to India, he had completed the manuscript for a new Monograph on the silicates to be published early this year.

He was a past president of the American Institute of Chemical Engineers, past chairman of the Philadelphia Section of the American Chemical Society, past chairman of the American Section of the Society of Chemical Industry, and a fellow of the American Institute of Chemists and of the American Ceramic Society. He was a member of the Franklin Institute, University Club of Philadelphia, Chemists Club of New York, Cosmos Club of Washington.

Aside from his technical work, Dr Vail, a Quaker, was long engaged in the work of the American Friends Service Committee, beginning in 1920 with the feeding of German children in cooperation with the Hoover Commission. He had served for years as a director and as chairman of the foreign service executive committee. One undertaking for the Committee took him to Palestine in April, 1948 to confer with the Arab and Jewish leaders during an Easter truce called by the United Nations in the Arab-Israeli War.

He is survived by his wife, Ruth Russell Vail and two sons, Benjamin of Media, Pa, and Philip of Topeka, Kansas.

JAMES A RAFFERTY

JAMES A RAFFERTY, vice-president and director of Union Carbide and Carbon Corporation died in Ft Lauderdale, Fla, on Dec 20. He was 65 years of age.

Mr Rafferty was a pioneer in the development of the synthetic organic chemical industry in the United States, which was built up largely under his direction since its beginning in 1920. During World War II he was executive official in charge of the extensive operations of Union Carbide in behalf of the government's wartime synthetic rubber and atomic energy programs.

The key part Mr Rafferty played in the development of atomic energy was typical of his work and synthetic rubber also owed much to his leadership.

In 1948 he was awarded the Chemical Industry Medal by the Society of Chemical Industry for outstanding application of chemical research in industry in the development of the aliphatic chemical business. The Chemical and Engineering Award was given to his company in 1943 in recognition of outstanding work under Mr Rafferty's direction in the synthetic rubber achievement, and again in 1946 for the atomic energy accomplishments. He received the honorary degree of Doctor of Engineering from Illinois Institute of Technology in 1944.

After working up to the position of Chief Chemist in The Peoples Gas, Light and Coke Company of Chicago, he joined The Linde Air Products Company in 1917 and rapidly rose to the position of Works Manager. In 1920, Mr Rafferty became General Manager of Union Carbide's newly formed Carbide and Carbon Chemicals Corporation and took a leading role in sponsoring its pioneering and eventual leadership in the commercial development of the synthetic aliphatic chemical industry.

His success in this association led to his election as a Vice-President of Carbide and Carbon Chemicals Corporation in 1924. The following year he was elected a Vice-President of The Linde Air Products Company. In 1929 he was made President of Carbide and Carbon Chemicals Corporation, and in 1939 he was elected President of Bakelite Corporation. He became Chairman of the Board of both of the latter companies in 1944.

His activities have extended to many other positions in Union Carbide and Carbon Corporation where he was made vice-president in 1938. In 1941 he was made a Director, and in 1944 he became a member of the Executive Committee of the Corporation.

Mr Rafferty's prime interests have always centered on the field of scientific research and development.

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